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Assessing the Environmental Justice Impacts of Toll Road Projects

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Assessing the Environmental Justice Impacts of Toll Road Projects

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Abstract

Assessing the Environmental Justice Impacts of Toll Road Projects

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Inadequate and uncertain transportation funding have in recent years resulted in a renewed emphasis on using investments that can be recovered by toll charges to finance new roads and modernize existing roads. This has raised questions about environmental justice (EJ) and how it pertains to tolling. In 2004, TxDOT Project 0-5208 was funded to propose an approach for the identification, measurement, and mitigation of disproportionately high or adverse impacts imposed on minority and low-income (EJ) communities by toll roads relative to non-tolled facilities. The methodology proposed had two equally important components: an analysis/quantitative component and an effective EJ participation component. However, the research raised concerns about the ability of various available analytical tools and analysis techniques to measure the potential impacts imposed on EJ communities by toll roads relative to non-toll roads. The objective of this thesis study was to extend the work that was conducted under TxDOT Research Project 0-5208 by (a) reviewing the ability of available tools and analysis techniques to quantify and qualitatively describe the EJ impacts associated with toll road projects and toll road systems through an evaluation of state-of-the-practice applications, and (b) recommending a suitable approach to assess the EJ impacts of toll roads and toll road systems on EJ communities. The research conducted to meet the study objectives has culminated in this thesis.

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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND[1]

Environmental justice (EJ) is "fundamentally about fairness toward the disadvantaged and often addresses the exclusion of racial and ethnic minorities from decision-making" (Cairns, Greig, and Wachs, 2003). In essence, the goal is to ensure that the benefits and burdens (i.e. air pollution, noise, injuries, fatalities, division of communities) are distributed in a manner that will promote a just and equitable society (Cairns, Greig, and Wachs, 2003). EJ becomes an issue when minority or low-income communities (referred to as EJ communities) receive fewer benefits and may be disproportionately impacted by transportation investments. The burdens may be the result of negative social, economic, or environmental impacts imposed on those living in impacted areas.

Highway funding constraints have in recent years resulted in the financing of new roads and the modernization of existing roads through investments that will be recovered by toll charges. In Texas, toll equity and Regional Mobility Authorities (RMAs) are voter-approved financial tools to leverage limited state transportation funds. Potential benefits for the Texas Department of Transportation (TxDOT) include savings as RMAs take responsibility for developing infrastructure projects, reduced maintenance expenditures associated with reduced traffic on department facilities, and additional revenue sources. In December 2003, the Texas Transportation Commission (Commission) approved a policy that directed TxDOT, RMAs, private developers, counties, and regional toll authorities to evaluate the feasibility of tolling all controlled-access mobility projects in any phase of development or construction (TxDOT, 2004). This directive applied to the following: new facilities, increased capacity (for example, adding frontage roads to existing main lanes), the conversion of existing non-toll roads to toll roads, and the conversion of planned non-toll roads to toll roads. However, this

[1] The information for this section was obtained from TxDOT Technical Report 0-5208-R1 (Prozzi et al., 2006).

directive has raised some questions about environmental justice and how that relates to tolling. EJ is a concern when:

- some communities benefit from improved access, faster trips, and congestion relief, while minority or low income communities receive fewer of these benefits,
- minority or low income communities are disproportionately impacted by transportation projects in terms of social, economic, and environmental burdens, or
- minority or low income communities are less represented in decision making (Cairns et al., 2003).

The objective of TxDOT research study 0-5208, entitled "*Evaluation of Environmental Justice Aspects of the Tolling of Existing Non-toll and Toll Roads*," was to present an approach for the identification, measurement, and mitigation of disproportionately high or adverse impacts imposed on minority and low-income (EJ) communities by toll roads compared to non-toll roads.

Transportation pricing strategies irrespective of the objectives—whether it is to reduce traffic congestion, protect the natural environment, increase transportation revenues, or facilitate the adding of capacity—generally raise equity concerns. In general, an EJ analysis is required when one of the following two conditions exists:

1. There is an EJ community in the impacted area, or
2. The adverse impacts caused by a transportation project could impact the EJ community disproportionately.

Whether a toll has a disproportionate impact on EJ communities, however, is a function of how many lower-income drivers use the toll facility, how many low-income drivers are priced out of discretionary trips (e.g., shopping trips and recreational trips), the quality of available alternative transportation options, and how toll revenues are used (Litman, 1996 & 2005, and Giuliano, 1994). The EJ analysis of toll roads is complex as

is evident from Table 1.1, which summarizes the relevant features of a toll road that may potentially impact EJ outcomes.

Table 1.1: Toll Road Features Relevant for EJ Analysis

Features	Examples
Type of facility	Converting existing non-toll roads into toll roads
Demographic characteristics of the commuter population	High percentage of low-income/minority travelers and low percentage of high-income travelers
Demographic characteristics of the neighborhood adjacent to the facility	Facility to divide low-income African American neighborhood
Corridor alternatives, including non-auto mode	No non-toll road available Non-toll roads available as "frontage roads" Low frequency of public transit service
Access control	Limited access to local minority neighborhoods Improved access to sensitive places (i.e., hospitals)
Toll pricing structure	Flat rate Dynamic rate Differential rate (e.g., low-income commuters pay less than high-income commuters)

If an EJ analysis is required, then the scoping part of the NEPA process has to be expanded to ensure that low-income and minority populations participate in project decisions and that opportunities are provided for them to become informed, and to voice their concerns. TXDOT research study 0-5208 recommended an EJ Evaluation Methodology (EJEM) to identify, measure, and mitigate EJ concerns associated with four defined toll road scenarios relative to non-toll roads. These four toll road scenarios (see Table 1.2) were conceptualized considering the tolling policy adopted in 2003 by the Commission. The Commission's tolling policy applies to new location facilities, capacity enhancements (e.g., additional main lanes or frontage roads to existing facilities), the conversion of existing non-toll roads into toll roads, and the conversion of planned non-toll roads to toll roads upon completion.

Table 1.2: Toll Road Scenario Characteristics

Scenario Characteristics	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Funding	Federal funding	Federal funding	Federal funding	Federal funding
Location	Existing location (existing road)	New location (new road)	New location (new road)	Existing location (existing road)
Alternative non-toll road within the same right-of-way	No	Not applicable	Not applicable	Yes (frontage roads)
Planned/ Constructed	As a non-toll road	As a toll road	As a non-toll road	As a non-toll road
Operated	Initially operated as a non-toll road. Non-toll road converted into a toll road after a period of time.	As a toll road	As a toll road	Initially operated as a non-toll road. After a period of time, (a) the existing lanes are tolled and adjacent frontage roads are added as non-toll alternatives or (b) the new lanes built in the grass median are tolled and the existing lanes are kept as non-toll alternatives. In both cases, the new capacity is provided within the same right-of-way.

The methodology developed in TxDOT research study 0-5208 has two equally important components: an analysis/quantitative and an effective EJ participation component (see Figure 1.1).

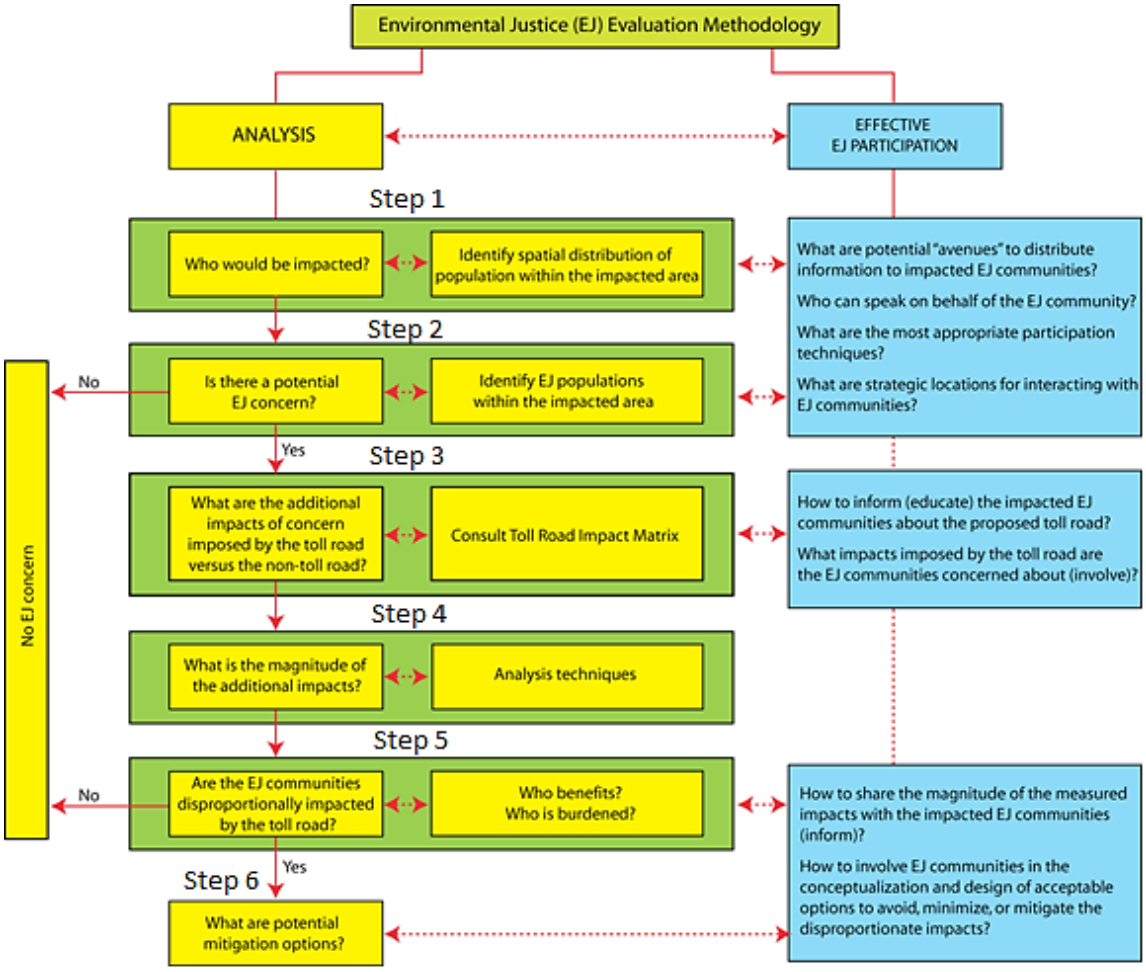

Figure 1.1: Environmental Justice Evaluation Method

1.1.1 Step 1: Identify Impacted Populations

The first step in the analysis component of the methodology is the identification of the populations which are potentially impacted by the proposed toll road. When identifying impacted population groups at the project level the scale of geographic analysis (i.e., census tract, block, block group, and TAZs)[2] selected is very important

[2] Forkenbrock and Sheeley (2004) recommended the following scale of geographic analysis when using U.S. Census Data:

- states, counties, and census tracts for the initial assessment of corridor studies and when the impacts are assumed to be uniform over the affected area, and
- block, block group, and TAZs for detailed corridor-level and project-level assessment and when the impacts require a high degree of demographic resolution.

because it could potentially affect the demographic profiles of the impacted area. For example, the identification of EJ communities using the conventional approach, which classifies communities into target (EJ) and non-target (non-EJ) populations using threshold values, is influenced by the geographic scale of analysis used[3].

1.1.2 Step 2: Identify Impacted EJ Populations

Step 2 identifies the EJ communities in the area impacted by the toll road. The Council on Environmental Quality (CEQ) guidelines (1997) states that an EJ community exists if one of the following conditions is present:

- The minority or low-income population exceeds 50 percent in the impacted area[4].
- The minority or low-income population percentage in the impacted area is "meaningfully greater" than the minority or low-income population in the general population or other appropriate geographic area.
- There is more than one minority or low-income group present and the minority or low-income percentage, as calculated by summing all minority or low-income persons, meets one of the thresholds presented above.

The USDOT and the FHWA require minority populations to be examined separately from low-income populations, but they do not specify exact thresholds for distinguishing minority or low-income communities.

1.1.3 Step 3: Identify Additional Impacts of Concern

Step 3 of the EJEM identifies the additional impacts of concern imposed by a toll road (alternative 2) compared to a non-toll road (alternative 1) given the four conceptualized scenarios. The four scenarios are described as follows: new location

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3 When identifying EJ communities using the threshold approach, the demographics of the impacted area is compared with the demographics of a more general area (referred to as the community of comparison or COC).

4 A low-income person is defined as an individual in a household whose median income is at or below the Department of Health and Human Service (HHS) poverty guidelines, but FHWA allows a state or region to adopt a higher income-threshold if it is not selectively implemented and if it includes all persons at or below the HHS poverty guidelines.

facilities, capacity enhancements (e.g., additional main lanes or frontage roads to existing facilities), the conversion of existing non-toll roads into toll roads, and the conversion of planned non-toll roads to toll roads upon completion. The following questions and sub-questions are examples of what needs to be answered when determining the additional impacts (i.e., benefits and burdens) imposed by toll roads on EJ communities compared to non-toll roads[5]:

- What are the additional physical environmental quality impacts?
  - Will the toll road result in a substantial amount of traffic being diverted through an EJ community? If yes, what are the additional air pollution impacts? If yes, what are the additional noise impacts?
- What are the additional mobility and safety impacts?
  - Will the toll result in low-income drivers being "priced out" of certain trips?
  - What reasonable alternative transportation modes are available to those that cannot afford the toll?
  - Will EJ individuals be forced to use less desirable modes or routes (to them) to satisfy their mobility needs?
  - Are there adequate/reasonable non-tolled north/south and east/west corridors to serve as alternative roads?
  - Will diverted traffic through EJ communities impose a higher safety risk to local pedestrians and cyclists?
  - How will the toll road impact transit (e.g., altered bus routes, transit times/schedules)?
- What are the additional social and economic impacts?
  - Will the non-toll alternatives be equitable in terms of travel time or distance?
  - How will the toll road impact business access for both customers and deliveries?

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[5] The answers to these and other questions were the basis of a detailed *Toll Road Impact Matrix* included in TxDOT Technical Report 0-5208-R2 that may be used by the analyst as a reference when identifying the additional benefits and burdens associated with toll roads (alternative 2) as compared to non-toll roads (alternative 1).

  - Will the toll road displace a larger number of residents and businesses compared to the non-toll roads?
  - How will the toll road impact property values (i.e., commercial vs residential)?
  - How will the toll road impact the access of EJ communities to work, schools, hospitals, etc.?
- What are the additional cultural impacts?
  - Will the toll road impact or discourage access to cultural and recreational resources (e.g., historic sites, historic landmarks, etc.)?

1.1.4 Step 4: Determine Magnitude of Additional Impacts

Step 4 of the EJEM attempts to measure the additional impacts associated with toll roads compared to non-toll roads in an effort to determine whether a toll road would burden EJ communities disproportionately as compared to non-EJ populations. TxDOT Technical Report 0-5208-R2 provides guidance on the use of a number of analytical tools (see Table 3.1) to measure the additional impacts of toll roads in terms of accessibility, air and noise quality, residential and commercial property values, and pedestrian and bicycle safety as conceptualized in the Toll Road Impact Matrix. The study further evaluated the proposed tools in terms of data needs, robustness, assumptions, required expertise, and cost.

1.1.5 Step 5: Evaluate Proportionality of Impacts

Step 5 of the EJEM determines whether the impacts imposed by a toll road on zones with medium and high concentrations of EJ populations are statistically significantly higher compared to zones with low concentrations of EJ populations. This is arguably the least well-defined aspect of EJ analysis. No guidance is available from Title VI or EO 12898 as to the criteria for adverse or disproportionate and limited guidance is provided by the CEQ. This requires two sub-steps:

1. *First,* the analyst needs to determine whether the measured impacts (Step 4) with the toll road (alternative 2) are statistically significantly higher than the

measured impacts with the non-toll road (alternative 1) by EJ concentration level (i.e., vertical comparison).

2. *Second*, if a statistically significant impact is imposed by the toll road, the analyst needs to determine whether the impact imposed on zones with high and medium concentrations of EJ populations are statistically significantly higher than the impact imposed on zones with no or low concentrations of EJ populations (i.e., horizontal comparison). Figure 1.2 provides a graphical representation of the vertical and horizontal comparisons that needs to be undertaken.

Alternatives	**EJ Concentration Zones**					
	Low		Medium		High	
1 (non-toll road condition)	MI_{01}	↕	MI_{02}	↕	MI_{03}	↕
2 (toll road condition)	MI_{11}	↔	MI_{12}	↔	MI_{13}	↔

Notes: ↕ = comparison between the toll and non-toll alternative
↔ = comparison between impacted EJ concentration zones given a statistically significant impact
MI = measured impact

Figure 1.2: Comparisons Required to Determine Significant Impacts

1.1.6 Step 6: Determine Potential Mitigation Measures

Step 6 of the analytical component of the EJEM identifies actions to mitigate or offset identified disproportionately high and adverse impacts imposed on zones with high and medium concentrations of EJ populations. Mitigation or enhancement measures comprise (1) avoiding or minimizing impacts by reducing the degree or magnitude of the implemented action, (2) mitigating or eliminating the impact by repairing, rehabilitating, or restoring the impacted environment or community resource, (3) reducing or eliminating the impact over time by long-term preservation and maintenance operations, and (4) compensating for the impact incurred. Table 1.3 lists a number of mitigation strategies that have been found acceptable by EJ communities to reduce or eliminate the impacts of highways and toll roads.

Table 1.3: Actions to Mitigate or Offset the Burdens Imposed by Toll Projects on EJ Communities

Impact	Mitigation Options
Neighborhood Effects	
Displacement of residential properties	Temporary or permanent relocation of housing units Construction of new housing units Fair relocation benefits
Remaining residential properties	Renovation of housing units
Neighborhood cohesion, social interaction	Relocation of the entire community Renovation of public areas used for community activities
Disruption of areas of unique significance (cemeteries)	Relocation of graves
Neighborhood safety	Crossing guards at local schools during project construction
Neighborhood traffic patterns	Ban heavy vehicles from neighborhood streets
Access to work	Relocation site accessible by primary neighborhood transportation mode Use of toll revenue to finance transportation improvements, such as new or expanded transit services that benefit low-income travelers Increase the quantity and quality of low-cost transportation alternatives Provide toll exemptions to low-income travelers
Access to community facilities and services	Conversion of former buildings to community centers Construction of parks and community centers
Noise effect	Noise barriers to reduce highway noise levels Soundproofing systems at sensitive sites (e.g., churches)
Local Business Effects	
Displacement of businesses	Permanent relocation of businesses
Effects on employment	Fair share of contracts generated by the project earmarked for local businesses
Effects on business access	Maintain or enhance access to local businesses
Economic Development Effects	
Job creation	Fair employment opportunities for local residents during construction phase
Effects on income	Return toll revenue to low-income households in the form of reduced regressive taxes and improved social services Reduce general taxes or other user fees Redistribute toll revenues according to income (i.e., lowest-income individuals receive the largest compensation)

Sources: Litman (1999), FHWA (2000), Lee (2003), DeCorla-Souza and Skaer (2003), and Litman (2004)

Ultimately, however, mitigation actions have to be determined in consultation with the impacted EJ communities.

One of the core principles of EJ analysis is the "meaningful" involvement of minority and low-income communities potentially impacted by a proposed investment in the decision-making process surrounding the proposed investment. Victoria et al. (2006) outline some of the key considerations in informing and involving EJ communities in toll road decisions, as well as guidance on which stages of the EJEM require EJ participation. In general, the report argued that effective and meaningful public involvement requires:

- Understanding the EJ community, including the barriers faced by EJ communities and options on how to overcome these barriers.
- Defining the goals of the EJ outreach/participation effort.
- Identifying and selecting the most appropriate participation technique(s).
- Managing and implementing the selected participation technique(s).

Also, EJ outreach efforts were foreseen in various stages of the EJEM to ensure that (1) all EJ communities are identified and given the opportunity to participate in a meaningful way, (2) all the adverse impacts are identified and prioritized, (3) the measured impacts are shared with the impacted EJ communities, and (4) effective mitigation options are designed in consultation with the impacted EJ communities to lessen or offset identified disproportionately high or adverse impacts.

Specifically, during the "*Who Would Be Impacted?/ Is there a Potential EJ Concern?"* step of the analysis component of the EJEM, EJ communities should be invited to participate as early as possible. The goals of the EJ outreach effort during this step are to:

- Validate the data used to identify EJ communities within the impacted area.
- Identify potential "avenues" that can be used to distribute information about the proposed toll project to minority and low-income people living in the impacted area.
- Obtain input from those that can speak on behalf of the EJ community. In other words, identify and engage individuals, such as presidents of neighborhood associations, religious/community leaders, school district

officials, environmental group leaders, leaders of charity organizations, elected local government representatives, and local health officials.

- Identify the most appropriate participation technique(s) for informing and involving the impacted EJ communities.
- Identify strategic locations for liaising with EJ communities.

During the "*What are the Additional Impacts of Concern Imposed by the Toll Road versus the Non-Toll Road?"* step of the EJEM, the goals are to: inform the EJ community about the proposed toll road project (educate the community) and to involve the community by obtaining their views and concerns about how the proposed toll project will impact their trips and community.

It is very important that the EJ community and representatives of the community are educated about the proposed toll project and understand the potential impacts to ensure an informed and meaningful discussion and prioritization of the impacts of concern surrounding toll roads relative to non-toll roads. The EJ analysis of toll road projects is especially complex, because toll roads may impose additional burdens as well as benefits on EJ communities compared to non-toll roads. Furthermore, EJ communities might be unsure of how a toll road will impact them, especially if they do not have their own cars and tend to use public transportation. These benefits and burdens need to be identified and discussed with the impacted EJ communities.

Once the communities understand the technical issues and can articulate how they think the proposed toll road would impact their activity space (i.e., the places where they live, work, shop, and partake in other activities) meaningful and informed participation can be accomplished.

During the "*Are the EJ Communities Disproportionately Impacted by the Toll Road?/ What are Potential Mitigation Options?",* step of the EJEM, the goals of the EJ outreach effort are to: inform the EJ community about the magnitude of the additional impacts (benefits and burdens) associated with the proposed toll road project compared to the non-toll road (educate the community) and to involve the EJ community in the

conceptualization and design of acceptable options to avoid, minimize, or mitigate any disproportionate impact on the community.

The analyst should present upfront the measured benefits and burdens imposed by the toll road project on the EJ communities calculated in steps 4 and 5 of the analytical component of the EJEM. Once the EJ communities have gained an understanding of how they will be impacted by the toll road, appropriate mitigation options can be designed. EJ communities should actively participate in problem solving to mitigate or remediate the adverse impacts imposed on their communities. Ultimately, these mitigation options should help ensure that the toll road project is designed, built, and operated without disproportionate burdening of the EJ community. A number of avenues exist to share information about the impacts of the proposed toll project, such as personalized letters, outreach booths, public meetings, and open houses. On the other hand, focus groups and Deliberative Polling® may be appropriate tools to obtain the input of community members regarding potential mitigation option.

1.2 STUDY OBJECTIVES

Given the fiscal constraints of the traditional roadway funding sources, the financing of new roads and the modernization of existing roads through investments that will be recovered through toll charges have been promoted at both the national and state level. This has continued to raise questions about environmental justice (EJ) and how it relates to tolling. Victoria et al. (2006) raised concerns specifically during Step 4 of the analytical component of the EJEM. This step aimed to identify available analytical tools that may be used to estimate the magnitude of the additional impacts of a toll road on EJ communities. The review of these tools revealed that they may not be suitable to address the issue of measuring EJ impacts. Many of the tools are not sensitive enough to be used at a scale which can detect the impacts on certain smaller pockets of EJ communities.

The objectives of this thesis were to extend the work conducted under TxDOT Research Project 0-5208 by (a) reviewing the robustness of available tools and analysis techniques through an evaluation of state-of-the-practice applications of these tools and

analysis techniques in quantifying and qualitatively describing the EJ impacts associated with toll road projects and toll road systems, and (b) recommending a suitable approach to assess the impacts of toll roads and toll road systems on EJ communities.

The research conducted to meet these objectives has culminated in this thesis, which has been structured as follows. Chapter 1 provides the background work which was completed during TxDOT Project 0-5208 as well as the current study objectives. Chapter 2 summarizes both the literature and the legal reviews that were conducted. These reviews focus on publications and legal cases which have occurred since 2004, which is when TxDOT Project 0-5208 was completed. Chapter 3 describes the study approach, which consisted of interviews with key stakeholders as well as state-of-the-practice surveys of State DOTs, MPOs, and RMAs. These two components of the study approach aimed to define key terms and definitions used for measuring EJ impacts, as well as determine the state-of-the-practice with regards to what DOTs, MPOs, and RMAs have done to identify and quantify EJ impacts as a result of tolling. Chapter 4 highlights eight case studies which describe the methodologies and analytical tools used by selected State DOTs or Turnpike Authorities in greater detail. Chapter 5 reviews the travel demand model and evaluates its use as an analytical tool for measuring and quantifying EJ impacts due to tolling. Chapter 6 focuses on how to best conduct an effective public outreach process and obtain the necessary information from the public to determine what the potential impacts of a toll project may be. Finally, Chapter 7 provides conclusions and recommendations given the results and findings of the interviews, surveys, and case studies completed throughout the course of the research for this thesis study.

CHAPTER 2: LITERATURE AND LEGAL REVIEW

The CTR study team conducted a "desk study" in TxDOT Project 0-5208 of analytical tools that could be used to measure EJ impacts of toll roads in terms of accessibility, air and noise quality, residential and commercial property values, and pedestrian and bicycle safety. Part of the current study effort entailed updating and expanding the study team's previous review of tools and analysis techniques to measure EJ impacts associated with toll roads and a legal review of any recent EJ court cases that have been brought forward since 2004. The literature review specifically focused on published reports, documents, transportation journal articles, and conference proceedings since 2004 when the initial review was completed. This chapter summarizes the salient findings of the literature review and also included an updated review of court judgments and law journal articles involving EJ litigation that have been brought forward in recent years. The manner in which courts have interpreted EJ analysis in NEPA documentation was also noted.

2.1 LITERATURE REVIEW

The literature review consisted of the evaluation of 42 documents, comprising published reports, transportation journal articles, conference proceedings, and environmental documents. Each of these documents was categorized into one of the following types: qualitative analysis, mitigation analysis, demographic analysis, or quantitative analysis. Eleven studies are discussed in this chapter to highlight examples of each of these types of analysis. The quantitative analysis studies are mainly "desk studies" or academic studies in which the analysis tools proposed have not necessarily been adopted in practice.

2.1.1 Qualitative Studies

Some studies that were reviewed as a part of the literature review for this thesis discussed toll road impacts on EJ communities in a qualitative manner. They focused on the definitions of equity, and the factors that play a role in determining whether equity

has been achieved in the case of a toll road project. However, toll road impacts and their effect on equity were never calculated in a numeric form. Examples of reports that were categorized as qualitative studies include:

- "**This land is your land, this land is my land: Addressing equity and fairness in tolling and pricing**" by David Ungemah
- **"Value Pricing Pilot Program: Lessons Learned"** by Kiran Bhatt et al.
- **"Environmental Justice Analysis: Challenges for Metropolitan Transportation Planning"** by Jen Duthie, Ken Cervenka, and Travis S. Waller

In the report entitled "This land is your land, this land is my land: Addressing equity and fairness in tolling and pricing" (Ungemah, 2007), five types of equity are defined. These are geographic, income, participation, opportunity, and modal equity. The study, however, focused mostly on geographic and income equity, because these are more important during the planning process. There is less focus on the other three types of equity due to the fact that participation, opportunity, and modal equity can also be defined in terms of either geographic or income equity. Income equity is based within the principles of EJ, and geographic equity is reflected in public opinion, but more difficult to mitigate. Income inequity may be occurring when toll projects create a spillover effect onto adjacent facilities. Also, inequity would be present in the case where the value of time for a low-income driver is greater than the value of the toll charge. Value of time is usually estimated to be correlated with an individual's income, which means that a low income individual would have a lower value of time than a person with a high income. However, low income jobs are often inflexible with respect to arrival time. If an employee is late, the punishment may be a series of warnings and, finally, job termination. This low income employee's value of time would therefore be greater than the value of the toll charge; however, they will most likely not be able to afford the toll. The effects of these income inequities are examined theoretically and the impacts are projected, but none of these impacts are calculated. The study examines the net effects of

tolling on EJ communities and includes both negative and positive impacts. For example, toll roads or priced facilities may also provide low income populations with better means to access opportunities for income advancement. This study states that correctly identifying equity concerns and addressing them through deliberate and transparent policies and action can help further the case for tolls in a broad transportation financing and planning context. However, explicit methods for doing so are not outlined in this study. The proposed analysis is simply qualitative and demonstrates the need to be aware of potential equity concerns during the planning process.

In the study entitled "Value Pricing Pilot Program: Lessons Learned" (Bhatt et al., 2008), a summary of projects sponsored by FHWA's Congestion and Value Pricing Pilot Programs from 1991 through 2006 is provided. It compiles lessons from a sample of projects containing the most relevant experience across selected project categories. Since the foundation of the Congestion Pricing Pilot Program in 1991, over 50 pricing projects have been funded by FHWA. More than a dozen operational projects are providing important findings regarding traffic and congestion impacts, transportation funding issues, public acceptability, administrative matters, and future prospects for addressing congestion using various pricing strategies. In addition, useful information and valuable lessons have been provided by project feasibility studies and by pricing projects that did not progress to implementation or exhibited unexpected outcomes. In particular, the equity impacts of variable pricing were discussed in this report. There will always be some users who benefits from the time savings and reliability of the toll road, and those who will not. This is due to the concept of an individual's value of time and whether it is higher than the cost of the toll. Those who do not value their time more than the cost of the toll may be forced to shift to off-peak times, alternate routes, alternate modes, or they may simply make fewer trips. The public's perception of fairness also depends on the allocation of revenues and which alternate policies are considered to mitigate congestion. The report states that the differences among incomes of the facility users are not dramatic, and that this represents a certain level of equity. These results are said to

indicate that many of the equity concerns raised about the perception of inequities may be overestimated.

The report entitled "Environmental Justice Analysis: Challenges for Metropolitan Transportation Planning" (Duthie et al., 2007) focuses on the three major challenges involved with incorporating EJ into Metropolitan Transportation Planning. These three challenges are: collecting the necessary data, coming to a consensus on how equity should be defined in the context of EJ, and using an appropriate unit of analysis. Several conflicting definitions of equity are presented, as well as the possible applications within the context of EJ for each. The four types of equity most applicable to transportation planning are referred to in this report as "opportunity," "equality," "market based," and "basic needs." The FHWA does not provide clear guidance on how to define equity, so the decision must be made by individual MPOs. Moreover, the decision of which type of equity should be achieved does not make plan or project selections among alternatives any simpler. Not only does equity need to be achieved in impacts, but also in public involvement and funding. For example, equitable funding does not necessarily mean that the impacts will be equitable. Another crucial aspect of EJ impact analysis is the time frame in which it is measured. Impacts can be examined in the future year or focusing on the change in impacts from the base year to the future year. One major debate is whether EJ should address past injustices which have been brought upon communities. Most MPOs do not consider this to be a goal during the planning process, and focus on the change in impacts from a base year to the future year.

2.1.2 Identifying Mitigation Measures

A number of studies aimed to identify appropriate mitigation measures for a given "priced" facility or toll road. Mitigation measures can include avoiding or minimizing impacts from project actions, mitigating the impact, reducing the impact over time, or compensating for the impact incurred. For example, mitigation measures for reducing potential negative effects of toll roads include distributing rebates or credits or transferring revenues to transit or carpooling services to offset some of the costs of using

the facility. Additionally, public meetings and public involvement in general serve as very useful tools for developing mitigation strategies that are essential for a given project. The following are examples of these studies:

- "**Income-Based Equity Impacts of Congestion Pricing**" by FHWA Office of Transportation Management
- "**Environmental Justice Issues Related to Transponder Ownership and Road Pricing**" by Emily Parkany

The study entitled "Income-Based Equity Impacts of Congestion Pricing" (FHWA, 2008) was produced to examine the impacts of congestion pricing on low-income groups, public opinion as expressed by various income groups, and ways to mitigate the equity impacts of congestion pricing. One of the main ways in which toll impacts can be mitigated is through the redistribution of toll revenues. If these revenues are solely spent to finance highway improvements, equity impacts would be considered to be even more severe. The distribution of rebates or credits can be used to mitigate equity impacts as well as the utilization of revenue towards improved transit service or carpooling services in the priced corridor. In central London, the revenues from cordon pricing were used partially to provide improved bus service within the priced area, which in turn enhanced transit services for the low income groups and other system users. Some areas have even passed legislation that requires a portion of toll revenues to be dedicated towards transit, although these are not necessarily distributed to EJ users. For example, in California the statutes mandate that 18 percent of all roll revenues from the Bay Area Toll Authority must be transferred to accounts held by the Metropolitan Transportation Commission, which is a regional multimodal planning agency. Similarly, the Port Authority of New York and New Jersey uses surplus toll revenue to finance transit services. When the city of New York proposed a cordon-pricing scheme similar to that which has been implemented in London, it also included a tax rebate for drivers who qualified for a federal-earned income tax credit. Another example involves the San Francisco Bay Bridge, which proposed a congestion-pricing scheme that raised tolls from $1 to $3 per trip. However, the proposal also offered a "reduced lifeline" toll rate of $1

for low income users. These are all examples of policies that may be utilized to mitigate the equity impacts associated with priced facilities.

The report entitled "Environmental Justice Issues Related to Transponder Ownership and Road Pricing" (Parkany, 2005) discusses the ways in which EJ affects transponder ownership. Acquiring a transponder often requires the user to have a credit card as well as a large deposit or toll prepayment to begin a transponder account. This is usually enough to prevent an EJ roadway user from being able to obtain a transponder because they likely do not hold a credit or checking account and cannot afford to prepay a significant amount for tolls. In many cases, the barrier that prevents EJ individuals from obtaining a transponder is comprised of more than a monetary value. Being able to mitigate this barrier requires understanding what it truly involves. The author's previous research includes an attempt to quantify the hurdle to obtaining a transponder for an EJ individual, but it did not include credit card and banking characteristics of roadway users or consider the transponder application process in great detail. The study uses a binary model of transponder ownership, a binary model of toll road usage conditional on transponder ownership, and ordered logit models of toll road use frequency. Income, gender, and education level were some of the independent variables used. The study concluded that income does have a positive influence on toll road use, road use frequency, and transponder ownership. Discussions related to EJ have included providing coupons or discounts to low-income groups who cannot afford to set up an account for a transponder on their own. Those who have inflexible work schedules, often EJ individuals, could benefit from toll lanes by using subsidized tolls. However, it is important that agencies designing the subsidy policies are aware of the difficulties that are present in obtaining and maintaining a transponder account. One example of a toll transponder system that has taken measures to mitigate the difficulty of obtainment is in Puerto Rico. Users may buy and replenish cards at easily accessible locations, such as gas stations and convenience stores. They are also notified when their account is low and needs to be replenished by way of a yellow light when they pass through a toll facility.

Measures taken such as these may help to mitigate the negative impacts that toll facilities and the challenges that come with transponder ownership have on EJ individuals.

2.1.3 Demographic Analysis

Another type of study which was examined during the literature review is one in which a demographic analysis of the study area is conducted to understand where the EJ communities are located. The following are examples of literature which exemplify this type of study:

- "**Spatial Methodology for Assessing Distribution of Transportation Project Impacts with EJ Framework**" by Nicholas Klein
- **NCHRP Report 532: Method 9, EJ index**
- **EJ Estimator and Socio-Economic Report** by Cubit Planning

The study entitled "Spatial Methodology for Assessing Distribution of Transportation Project Impacts with EJ Framework" (Klein, 2007) focused on the importance of understanding the demographics of the project area within the context of EJ. Initially, a calculation is done to determine the degree of disadvantage for each census tract in the region. This value identifies the above-average percentages of a certain population group in the given tract. Eight categories were outlined in this study: minorities (not including Hispanics), Hispanics, elderly, car-less, disabled, impoverished, female-led households with children, and limited-English proficiency households. The degree of disadvantage is simply the sum of the percentages of all eight categories that are present in the census tract. Regional transportation project impacts are those that affect the users of the system who could be located anywhere, and local project impacts are those that primarily influence the area in which the project is located. The Delaware Valley Regional Planning Commission (DVRPC) method also includes examining which census tracts include a Transportation Improvement Program (TIP) project. This does not account for differences in the scale of the transportation impacts. TIP project impact distance limits are established and distributed over regions using a kernel-density function in ArcView. An input option is the monetary value of the project under study to

differentiate between relative intensities of each project. Spatial analysis using Geographic Information System (GIS) was conducted to determine areas or patterns which contain a concentration of impacts due to the TIP projects. The Getis-Ord (G*) statistic was utilized to test for statistical clustering. An exponential gravity model is also used where the impact decreases continuously as the distance from the project site increases. This method displays the distribution of TIP projects across populations groups and attempts to create a visual illustration of the spatial clustering, if any are present. The idea is that transportation investments should be fairly distributed amongst the population, and if there is uneven distribution, EJ will not be achieved. The importance of developing a more refined model that can assess the cumulative impacts of a project is also discussed in this study.

Method 9 of the NCHRP Report 532 (NCHRP, 2004) involves the Environmental Justice Index (EJI) which is a method of scoring relative levels of EJ concern based on population density, minority population, and low income population factors. Because multiple factors are used, the EJI method allows the distribution of all protected populations to be displayed on a single map. It can be used for showing relative concentrations of EJ populations, and also as a screening technique to determine which areas warrant a detailed assessment or substantial outreach. This is done by computing the demographic variables which are based off of census data. Typically, the block group level is used as the evaluation unit. The degree of vulnerability for density of minority and low income populations can be determined based on predetermined values. For example, if the population density is between 0 and 200 people per square mile, that geographic unit would receive a given degree of vulnerability score. These three scores are all multiplied to achieve an EJI, which ranges from 0 to 100. A very high EJI value indicates that the population density is high and that there are a high percentage of minority and/or low income individuals in that population. However, this method also holds limitations particularly due to the fact that it is a mathematical index. While indexes are helpful when depicting the combinations of variables as a single value, they should be used with caution if more detailed analysis is required. Specifically, the EJI

does not provide meaningful results for project areas that have uniform population density and EJ population characteristics.

The EJ Estimator and Socio-Economic Report (Cubit Planning, 2009) are designed to serve as helpful tools for EJ analysis. The EJ Estimator is mainly a starting point for an analyst to provide a brief overview of the demographics of a specific project area, highlighting areas with potential EJ communities. This tool uses the Council of Environmental Quality guidance, Department of Health and Human Services Poverty Guidelines, and census data from 2000 when determining where EJ populations are present. A threshold analysis is used for the EJ Estimator, which is recognized as a method that has been criticized by some agencies. However, it is emphasized that this particular estimation method is not intended to be a comprehensive analysis tool, but is merely intended to provide a quick estimate. First, the data is collected for each census block and block group that is located within a given area of analysis. Then, the total minority percent is calculated for each block and block group. If the total minority percent is greater than 50%, then minority EJ populations are said to be present. If the total minority percent is within a given range, minority EJ populations are said to be possible. For the low income calculation, data is first gathered which includes household data as opposed to simply family data. This is because the DHHS Poverty Guidelines are based on persons in households. For this tool, the DHHS poverty guideline is used along with the census data because they are both from 1999, which is $16,700 for a household of four. Low income EJ populations are considered to be present in a project area if the median household income is equal to or less than the 1999 poverty guideline for at least one block group. The Socio-Economic Report offers more detailed information than the EJ Estimator. A project corridor is first selected, and all census blocks that intersect with the roadway are highlighted, as well as a 100 foot buffer on either side of the roadway. The general population trends in the area are given based on available census data. The percent minority and low income are given, as well as more detailed transportation data for the same block groups. For example, the percentage of individuals who drove alone, carpooled, used public transportation, bicycled, or walked is indicated in a separate table.

Information is also given about the presence of disabled individuals or those who have limited English proficiency. This tool provides more detailed information than the EJ Estimator, and can be very useful for an analyst who is attempting to understand the demographics of a given project area.

2.1.4 Quantitative Analysis

The final study type is one where a quantitative analysis is done to determine the EJ impacts of a toll road project. The following are examples of literature reviewed which discuss quantitative analyses:

- **NCHRP Report 532: Method 8**
- "**Incorporating Environmental Justice Measures into Equilibrium-based Transportation Network Design Models**" by Jennifer Clare Duthie and Travis S. Waller
- "**The Impacts of Tolling on Low-income Persons in the Puget Sound Region**" by Robert Plotnick et al.

Method 8 of the NCHRP Report 532 (NCHRP, 2004) outlines a way in which to measure population projections, and is ideal for projects with time spans of at least five years. This method estimates the small-area populations and predicts population changes for multiple population groups over time. Growth forecasts are generated every 2 to 3 years for housing, population, and employment, and the timeline used for these projections is usually 20 or 25 years ahead. The variables used during projections include the number of births, number of deaths, immigration and emigration records, housing permits, vehicle registrations, and school enrollment figures. Typically, MPOs develop these county and subarea population projections using standard methodologies such as demographic, trend-based, land use, and general plan models. Land use models may be useful for toll-road projects since they capture population densities and the relative attractiveness of different areas. Examples of automated land use models that may be used include: MEPLAN, TRANUS, and UPLAN. These models are based on information which characterizes, for example, vacant land which may be developed and

has a greater potential population capacity. The Projective Land Use Model (PLUM) uses data from the US Census, employment locations, trip lengths, and population capacity to project population estimates. General plan models are also beneficial for EJ assessments because they can derive projection estimates for small areas, like those examined in EJ impact assessments. This report illustrates the basic steps of the Sacramento Area Council of Governments (SACOG) approach, which is used as a model for demonstrative purposes. First, total population projections for counties, cities, tracts, and TAZs are developed using a regression model that is chosen as the best candidate in a sub step of the process. The second step involves disaggregating the total population estimate into subpopulations that are of interest to the analyst, in this case, minority and/or low income populations. When developing the population projections, holding capacities must be evaluated in light of the area's development pattern. For example, an area's holding capacity may be reached sooner if it is mostly made up of low rise buildings that do not encourage dense development. Any of these models have the ability to produce population projections for small areas, such as the tracts or TAZs that are used in EJ analysis. However, the drawbacks to this method are that it is data intensive, time consuming, and requires a good deal of expertise.

The paper entitled "Incorporating Environmental Justice Measures into Equilibrium-based Transportation Network Design Models" (Duthie and Waller, 2007) discusses the three greatest challenges associated with incorporating EJ in metropolitan transportation planning and proposes a new variation of the user equilibrium discrete network design problem (UEDNDP). Ultimately, each MPO must decide what level -- and what type -- of equity they are trying to achieve. EJ can sometimes be defined in terms of how much funding is spent improving each population. However, this raises difficulties because of inflation measurements since improvement projects are most often long-term. Five data types are needed: spatial distribution of race and income, spatial distribution of trip ends, trip tables, network performance, and cost estimates of improvements. The importance of the unit of analysis of EJ measures is stressed in this study. For example, the most commonly used is the geographic unit, but this is not

necessarily the best measure since it assumes that all groups congregate spatially. Travel models that use microsimulataion to track activity patterns could help to resolve these data issues. HH survey data can also be used to track travel patterns, and later synthesize trip tables, related to each given population group, but this may improve precision and not accuracy. Also in this study, equilibrium based network models are examined in which nine objective functions are defined which are focused on maximizing the equity of congestion and travel time. These compare the equity change due to network improvements and determine the EJ impacts. This model is named an EJ-UE-DNDP model (Environmental Justice-User Equilibrium-Discrete Network Design Problem). A selectorecombinative GA (genetic algorithm) procedure was used to solve the problem. This GA method was successful in modeling a small network, however the ninth objective function is a utility function, and it was determined that this may be an applicable approach as well. However, the two desired objectives are somewhat conflicting: to diminish the difference in post-improvement performance across populations, and to minimize the difference in change of performance due to improvements for each group. This makes this multi-objective decision theory an attractive opportunity for future research, and an example function was tested to show that utility based multi-objective approaches can be applicable.

The last study, entitled "The Impacts of Tolling on Low-income Persons in the Puget Sound Region" (Plotnick et al., 2009), examined tolling impacts on low-income individuals in the Puget Sound Region. For the purposes of this study, low income was defined initially with the federal poverty guidelines of $22,050 for a family of four in 2009. However, because the project area is generally composed of individuals with higher incomes than this poverty level, the authors included the "near-poor" in the low income category. Using this same 2009 threshold, a family of 4 would be "near-poor" with an income above $22,050 but below $44,100 (Plotnick et al., 2009). Initially, a demographic analysis of the study area was conducted and a route density map was created. This density map is based on Household Activity Surveys in the region and, using a mapping algorithm, the most likely routes are determined and checked manually

against Google Maps. Based on these route densities, the demographics of the users of each road segment was determined and put into the form of tabulated data. This data depicted the income characteristics of the users by roadway segment. Subsequently, the annual toll burdens for low-income and non-low-income households were calculated based on assumptions about the toll and frequency of use. Toll costs as a percentage of income of low-income vs. non-low-income households were also calculated. These results in some cases indicated that poor users were spending up to 15% of their income on tolls, whereas non-poor users were spending only about 4% of their income. However, this method is very limited since it did not account for changes in travel times or route changes made by drivers. In other words, the assumptions did not allow for behavioral changes that are extremely likely to occur in the event that a toll is implemented.

2.2 LEGAL REVIEW[6]

The legal review conducted as a part of this study was focused on cases and activities regarding EJ that have occurred since 2004. Therefore, the review does not cover the background and history of the Executive Order, nor does it include cases brought prior to 2004 under Title VI of the Civil Rights Act of equal protection claims. Namely, it discusses the formative Supreme Court decision in Alexander v Sandoval in 2001. This decision had a strong impact on the ability to successfully bring an EJ claim (Linden, 2008), and effectively prevented many opportunities for plaintiffs to seek liberation within the federal court system.

There has been a substantial amount of activity in the U.S. regarding EJ policy. EJ is an issue that has come to the attention of a multitude of agencies, states, and entities that are involved in environmental review, permitting processes, and the development of

6 This section is based on the information presented in the legal review that was conducted as a part of TxDOT Project 0-6544 by a member of the CTR research team, Lisa Loftus-Otway.

infrastructure plans. A number of states[7] have enacted EJ statutes which place emphasis on enforcing compliance with the EJ Executive Order between 2004 and 2009. These statutes range from generally requiring that EJ issues be considered in city and county plans to having a specific focus, such as air quality or greater public participation and involvement.

Since 2004, much of the focus of federal policy regarding EJ has been on the EPA's handling of implementation. There has been criticism of the EPA's implementation of EJ, as well as its lack of guidance provided both within the agency itself and for other federal agencies. Specifically, the Government Accountability Office (GAO) criticized the EPA for the way it handled EJ issues when drafting clean air rules (GAO, 2005). The EPA reduced opportunities for EJ communities to access information when plans to modify the toxic release inventory program were announced in December 2006. EJ communities were also critical due to the fact that the EPA reduced the detailed reports on facilities that released substantial amounts of chemicals per year (Bullard, 2008). Despite these reproaches, EJ has become a more protracted exercise in community outreach for the EPA and other agencies. This has effectively raised the bar for agency officials and thereby forced these officials to develop more effective means of interacting with EJ communities. EJ has allowed these minority and/or low income communities access to funds, education, and resources (Linden, 2008).

However, the development of an environmental policy to address disparities in pollution exposure has not yet been accomplished. The EPA has not found a single Title VI violation by any of its grant recipients, according to Waterhouse (2009). In 2010, the Inter-American Commission on Human Rights agreed to examine the environmental racism complaints made in Mossville, Louisiana. This decision was made due to U.S. courts and federal agencies failing to provide relief from toxic pollution in the community as a result of 14 nearby chemical plants (IACHIR, 2010).

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[7] These states include: California, New Mexico, Michigan, Connecticut, and Oregon. Additionally, the City of Cincinnati has passed an Environmental Justice Ordinance which gives its police the power to enforce EJ by issuing "EJ permits".

While there have been no successful Title VI or EJ cases to date, it is important to note that the provisions of Title VI still govern agency activities. These agencies must apply the provisions of Title VI and EO 12898 in all of their administrative activities, decision making, and EJ analysis processes.

2.2.1 EJ Court Activity

Court activity regarding EJ has been much sparser than the activity which has been seen occurring on the policy front. According to the American Bar Association and Environmental Law Institute Environmental Justice text books that were published in 2008 and 2009, there have been no EJ claims under Title VI which have been successfully carried through the court system. This is not to say that there have not been any attempts to bring EJ claims; often these cases are now brought forth with an accompanying complaint that cites a failure to comply with provisions required under the National Environmental Policy Act (NEPA). These are typically EJ cases involving the allowance of heavy manufacturing and other toxic sites, and the decisions generally do not result in favor of the EJ plaintiff. This is because courts often defer to an agency's decision-making process in a NEPA document, and rarely conclude that an agency has acted in an arbitrary manner.

The reason for this figurative roadblock for EJ claims is the Supreme Court decision in Alexander v. Sandoval (Alexander v. Sandoval, 532 U.S. 275, 282 (2001)). This decision held that plaintiffs do not have a private right of action under Title VI of the Civil Rights Act of 1964 to enforce disparate impact regulations propagated by a federal grand recipient's program, and that Congress did not intend to create any new rights in §602 that did not exist in §601. This effectively limited the ways in which an EJ community could bring suit. In §601, the only right stated is the right to be free of intentional discrimination, which may be enforced by a private right of action. However, the court held that in §602, a private right of action is not included to enforce disparate impact regulations stated in Title VI because its focus is on the regulatory agencies, not

protected individuals or funding recipients. Since this decision, plaintiffs must prove discriminatory intent, which has not been proven to-date in an EJ case (Gerrard, 2009).

There have been a few seemingly promising opportunities[8] for plaintiffs to bring suit without directly utilizing §602 and therefore having to prove discriminatory intent. However, these alternatives were both further limited in separate court cases shortly after the Sandoval decision. Some lower courts have remained divided over the question of whether §602 may be enforced under §1983[9]. However, the general trend has been for federal courts to recognize only those rights "at least implicit in the statute" (Mank, 2009).

2.1.2 EJ Decisions in Transportation Since 2004

The research conducted as a part of the legal review did not reveal any reported cases regarding toll roads and EJ specifically in the Westlaw and Lexis databases. One reason for this may be that cases have been brought in lower courts, and a settlement was reached before litigation, therefore leaving no trace of a formal report.

However, a case was brought in 2009 in U.S. District Court for the Northern District of California. It involved the disparate impacts of transit on minority riders, and may be demonstrative of how a toll road project may be evaluated in courts. It is also instructive in observing how lower courts have applied tests regarding EJ disparate impacts in funding allocations (Sylvia Darensburg, et al., v. Metropolitan Transportation Commission., 611 F.Supp. 2d 994 (U.S. Dist. 2009)), as well as how a court reviews statistical analysis supporting both plaintiff and defendant's cases. The Metropolitan Transportation Commission (MTC) coordinates and finances all 26 independent transit operators in the nine-county area.

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8 One of these was a result of the suggestion made by Justice Stevens in the Sandoval case. He suggested that plaintiffs could still have the option to bring suit under 42 U.S.C.S. §1983, whereby §602 regulations could be enforced indirectly because regulations are 'laws' within a statutes meaning (Sandoval, 532 U.S. at 299-300 (Stevens, J., dissenting).

9 The Supreme Court in Gonzaga Univ. v. Doe, 536 U.S. 273, 286-87 (2002) limited plaintiffs ability to use §1983 to enforce statutory rights where the underlying statute did not create a right of action (see Gonzaga Univ., 536 U.S. at 286-87). However, this decision did not explicitly overrule previous Court decisions.

The case began because the plaintiffs believed the funding policies of the MTC caused a disparate impact on largely minority riders of Alameda-Contra Costa Transit Districts in favor of other lower minority riders of other Bay Area transit operators, which is in violation of California Government Code §11135. Plaintiffs argued that the funding allocation decisions of the MTC led to cuts in bus service which impacted components of their daily lives. In this case, the keywords "daily needs" and "necessary trips" were at the core of the argument. Plaintiffs claimed that the funding practices of the MTC prevented minority transit riders from meeting such daily needs, which include getting to and from work, school, the grocery store, the doctor, and day care. Individual plaintiffs explained how the reduced service impacted their ability to make their necessary trips, as well as negatively impacting their opportunities to obtain employment and their ability to pay bills within their budgets. As an example, one of the complainants noted that she had to take a taxi to medical appointments because transit was unreliable, which was difficult for her to afford on her social security income.

Judge Laporte stated that plaintiffs cannot generally criticize an overall decision-making process in the disparate impact context. They must identify a particular element or practice within the process which is believed to cause the disparate impact, which it seemed that the plaintiffs were able to do with regard to one of the MTC's specific practices. However, the court found that they did not show that the funding practices caused a "significantly disproportionate adverse impact on the plaintiff class." This decision is due to the fact that project are first chosen by the county congestion management agencies, and later brought to MTC. Because their role in this decision-making progress regarding project is so limited, the court found that MTC's funding allocation did not have a "significant adverse impact on the plaintiff class." The court gave great deference to the statistical analysis presented by the MTC. While the court was sympathetic to the plaintiff's expert witness, they noted that the MTC's practices were subject to complex constraints and policy goals, which present difficult trade-offs that must be made during decision-making processes. Therefore, the court held that the MTC had met the needs of showing a substantial legitimate justification for the

challenged funding practices, and that the plaintiffs had failed to prove a disparate impact on minority transit riders.

2.1.3 EJ Cases on Transportation Filed in 2009-2010

Two cases could potentially provide further insight into the issues surrounding tolling, NEPA review, and EJ analysis as they continue to move through the court system. These two cases were filed in late 2009 and early 2010.

Arlington County, Virginia filed a suit in federal court in September 2009, contending the FHWA and DOT decision to exempt significant portions of a proposed federal highway project from requirements under the Civil Rights Act of 1964. Arlington County alleged that this decision constituted intentional discrimination (County Board of Arlington Virginia, v. U.S. Dept. of Transportation, 2009 CV 01570 (D. D.C., filed Aug. 19, 2009). The proposed project involves the expansion of existing HOV lanes along the I-95/I-395 corridor into HOT lanes. The complaint of the county is that the corridor was arbitrarily segmented into a northern and southern section in an attempt to avoid environmental review of the northern section. Generally, Arlington County contains 40% minority individuals, and 7.8% of residents below the poverty line. The northern section contains four Census tracts of EJ communities which reside in close proximity to the corridor. The complaint alleges that the northern section was excluded from the environmental review to support growth in two southern counties which can be characterized by "white flight," and that the project would create a "new protected class-the largely white exurban single occupancy rider of sufficient wealth to be able to afford the payment of significant tolls." The complaint also states that the FHWA decision to allow the segmentation of the roadway during review, which thus authorized the northern section to undergo Categorical Exclusion, was "not only incorrect, but outlandish and rationally indefensible." Arlington County succeeded in the first court arguments in April 2010, and the suit has been allowed to move forward (Arlington, 2010).

In January 2010, a complaint was filed by several community organizations in Minnesota in federal district court. They alleged that a DOT, FTA, and local municipal

council plan to build an 11 mile light rail transit line violates the requirements of NEPA because it failed to sufficiently identify the adverse impacts of the project. The light rail line is also proposed to run through the historic African American Rondo community. The final EIS allegedly did not explicitly document the potential adverse impacts, specifically those to businesses, lost parking and property value, and tax increases, nor did it consider the direct, indirect, and cumulative impact of the proposed project adequately. In addition, the FEIS analyzed the impacts on community cohesion and displacement in an erroneous manner. This is of particular concern due to the fact that the community was originally displaced because of the construction of Interstate Highway 94. Following this displacement, gentrification and urban renewal also affected the community in the 1970s by further displacing them. The proposed light rail system will subject this community to a potential third disruption "via the economic engine of gentrification" (NAACP v. U.S. Dept. of Transportation, 10 CV 00147 (D. Minn., filed Jan. 19, 2010).

2.3 CONCLUDING REMARKS

The literature review revealed that there has not been a great deal of progress with regard to the analytical tools that are used to measure EJ impacts of toll roads. While there have been a number of methods examined which would potentially be able to quantify results, these have been entirely academic studies and have not been put into practice. There are also assumptions and therefore limitations involved with any of these tools that were examined, which may compromise the validity of the results. In reality, agencies have qualitatively analyzed the EJ impacts, proposed mitigation measures, and conducted public outreach. Also, the studies which discussed qualitative analysis of EJ impacts revealed the fact that doing so can be very ambiguous. Many key terms and definitions are not well defined, and there are many ways that an analyst can view and define equity. This makes it even more difficult to identify situations which are inequitable, and if so, whether that inequity is disproportionately impacting certain groups.

The legal review also demonstrated that there has been little progress in successfully brining an EJ suit successfully through the courts. The Supreme Court decision with regards to Sandoval in 2001 had minimized the options through which an EJ community could bring suit, and succeeding EJ cases were not successful. The Darensburg case in 2009 continued this trend with the EJ plaintiffs unable to prove that the funding allocations by the MTC had caused disparate impacts. However, two new complaints in late 2009 and early 2010 may change the direction of EJ cases with regards to tolling, and the Arlington County suit against USDOT-FHWA will certainly be a case to watch.

CHAPTER 3: STUDY APPROACH

Transportation agencies have found it extremely challenging to balance "*competing interests and interpretation[s] of environmental justice*" (Cairns, Greig, and Wachs, 2003). There appears to be no single definition for EJ, and the guidance about how to measure and mitigate impacts is often ambiguous. Therefore, one of the objectives of this study was to develop a common understanding with key stakeholders of how important terms and concepts surrounding EJ and toll roads can be defined and approached. Part of the difficulty in defining what constitutes an EJ impact is the fact that concerns associated with toll roads are often unique to the communities that are impacted. Key stakeholders were contacted, including the Federal Highway Administration (FHWA), the Environmental Protection Agency (EPA), and TxDOT's Environmental Affairs Division in an effort to define these concepts. A number of efforts were made to contact the Federal Transit Authority (FTA) and the United States Department of Transportation (USDOT), but these attempts were not successful.

In addition, state-of-the-practice telephone surveys were conducted with U.S. State DOTs, RMAs, and MPOs. The objective was to determine the state-of-the-practice with regards to how these agencies have (a) defined a toll road system, (b) identified EJ impacts –benefits and burdens—concerning toll roads and toll road systems, (c) measured the identified impacts including the data used, (d) addressed challenges or issues in measuring identified impacts, and (e) effectively communicated and worked with the impacted EJ communities. The study approach and outcome of these stakeholder interviews and telephone surveys are summarized in this chapter.

3.1 STAKEHOLDER INTERVIEWS

Key stakeholders were interviewed to develop a common understanding of how important terms and concepts would be defined and approached. Key stakeholders include members of the FHWA, EPA, and the TxDOT Environmental Affairs Division. The following questions were asked of each stakeholder that was contacted:

1. What constitutes a tolled facility under the scope of a project? For example, is any road that has a pricing component, such as a managed lane, considered a tolled facility?
2. What constitutes a toll road system? What are the decision criteria?[10] (a) number of toll roads constituting a system, (b) whether toll roads interconnect/intersect, (c) length of the toll roads, (d) non-tolled alternatives available, and (e) at what stage of development are toll roads considered a system?
3. What constitutes a disproportionate impact?
4. What constitutes appropriate indicators/performance measures when calculating EJ impacts (i.e. travel times/delays, reliability, affordability)?
5. What constitutes the project area? In other words, is there guidance as to how far from the project alignment should impacts be considered?

The results of the stakeholder interviews are summarized below.

The first question was answered during a meeting with representatives from both the FHWA and the TxDOT Environmental Affairs Division. Any lane that has a pricing element to it is considered a tolled facility. In response to asking whether a toll increase would force the lane to be viewed as a "new" tolled facility, the FHWA stated that if the project is complete and has been taken over by the toll entity, and that entity decides on a toll increase, it would not have to go through any Federal process. However, it would affect their system analysis which would have to be considered if used in any other future tolling project document. A change in policy -- such as not letting car poolers on a tolled lane for free because it was an existing HOV lane -- may have ramifications depending on the funding used to construct the original HOV lane.

The answer to the second question was also defined during the meeting with FHWA and TxDOT Environmental Affairs Division. A network of toll roads has the following characteristics:

[10] Although the definition of a toll road system may differ given the geographic context of the area, it is important that the decision criteria for defining a rural versus an urban toll road system be agreed upon.

- Multiple facilities are tolled,
- facilities to be tolled are interconnected, and
- elements of the network either already exist or are in the current MTP.

There was no specific definition given to distinguish between rural and urban toll road systems.

In all of the stakeholder interviews, the third question was recognized as the most difficult to define because it is so ambiguous. In an interview with the FHWA and TxDOT Environmental Affairs Division, it was determined that it would be relatively simple to determine whether an impact was disproportionate if statistical analysis were available. However, quantifying any impacts except for displacement or relocation impacts has been proven to be extremely difficult to accomplish. A representative from the FHWA suggested focusing the scope and listing certain factors that would affect a determination of disproportionately adverse impacts. During this type of analysis, the only quantification that could be given is the number of displacements as a result of the toll project. Therefore, it would still be difficult to compare the other impacts, which are expressed qualitatively, against quantitative displacement impacts. Two other representatives from the FHWA added that a "disproportionate adverse impact" is a difficult term to define, and that the net effects must include the benefits as well as the burdens. Benefits of a project can be defined as accessibility to opportunities including jobs, healthcare, and education. A burden can be defined, for example, as an increase in travel time or a decrease in the number of available opportunities. Both burdens and benefits must be considered when determining whether an impact is disproportionate. EJ communities receiving fewer benefits may also prove as justification for a disproportionate impact.

The fourth question asked what constitutes appropriate indicators or performance measures when calculating EJ impacts. An FHWA representative emphasized the need to examine the changes in travel times during an EJ analysis as an important indicator. Accessibility is another indicator that can be used, measured as the number of opportunities that can be accessed in 30 minutes by auto or 45 minutes by transit.

Another indicator, suggested by members of the FHWA, is that of the affordability of a toll road. For example, the toll cost can be expressed as a percentage of the average wage of an EJ individual or household based on the number of trips they make on the facility per year. The FHWA defined a "low income" wage for the study team as $22,500 per year. Comparisons can then be made between the percentage of an EJ wage and the percentage of a medium or high income wage being spent on tolls annually. However, these performance measures and indicators are merely examples of what can be done or what has been done in the past. There have not been any formal standards established which analysts can look towards for recommendations of the best performance measures or indicators to use in EJ analyses.

The last question was never formally answered by any of the key stakeholders that were interviewed. It was merely guessed that state DOTs use a boundary distance from the centerline of a project, but that sometimes an entire community that is partially included in this boundary may be affected. A representative from the FHWA did, however, offer an interesting additional piece of information. In California, there has been a great deal of backlash after an EJ analysis which concluded that EJ communities were in favor of toll roads, when in fact this was not the case. This toll road was also justified by dedicating some of the revenue to offer reduced bus fares for low income households. It seems that this situation could have benefitted from a more effective public outreach effort to determine the true concerns of the affected EJ communities.

3.2 Department of Transportation Interviews

Interviews were conducted with U.S. State Department of Transportations (DOTs), Metropolitan Planning Organizations (MPOs), and Regional Mobility Authorities (RMAs) to determine the state-of-the-practice with regards to how they have (a) defined a toll road system, (b) identified EJ impacts (both benefits and burdens) due to toll roads, (c) measured these identified impacts, (d) addressed challenges in measuring impacts, and (e) effectively communicated and worked with the impacted EJ communities. These surveys were conducted by telephone. Through these surveys, the

best practices were identified with regards to measuring EJ impacts of toll roads with specific focus on the tools and analysis techniques that are used to conduct these assessments.

3.2.1 Sampling Frame

Representatives/employees of the 50 state DOTs that were responsible for or involved in NEPA, environmental justice, or environmental documents within their agency were identified. In the case of some states, a separate Turnpike or Tollway Authority is responsible for toll roads/facilities. For these states, the Turnpike and Tollway Authorities were contacted for information regarding measuring the EJ impacts associated with toll facilities. During the telephone surveys, representatives were asked whether there were any MPOs in the state which have measured EJ impacts associated with toll roads.

3.2.2 Questionnaire

A survey instrument was developed which included questions that aimed to collect all the necessary information about the current EJ approach used at DOTs (see Text box).

1. Have you measured/ are you measuring EJ impacts of a (planned) toll road or toll road system/network?
2. What were the features of the toll road and or toll road system/network (describe the facility or system)?
3. What constituted the project area? In other words, how far from the project alignment was impacts considered?
4. How did you define the reference population?
5. How did you compile the demographic profile of the impacted area? How did you define low-income and minority households?
6. What EJ impacts associated with the toll road and toll road system/network have been quantified (e.g., travel times/ delays, reliability, noise, affordability etc.)?
7. How did you measure the EJ impacts associated with toll road and toll road systems/networks? (What tools or analysis techniques were used to measure the EJ impacts?)
8. How did you choose this tool or method to measure EJ impacts?
9. What were the alternatives that you were comparing the toll roads against?
10. How would you rate the tools and analysis techniques in terms of robustness, availability, cost, ease of calibration, data requirements, etc.?
11. Did your resulting measured impacts seem logical and do they agree with your observations?
12. What data did you use?
13. How were the data obtained (e.g. revealed preference or stated preference surveys)?
14. How did you define what constitutes a disproportionate impact?
15. Did you communicate the measured impacts with EJ communities? If yes, how did you communicate the measured impacts with impacted EJ communities?
16. What challenges have been experienced in measuring the EJ impacts (e.g., data availability, skills required to measure impacts)?
17. How have you addressed the challenges experienced?
18. Do you have any documentation that you would be willing to share with us to improve our understanding of the method and analysis tools that you use to quantify EJ impacts associated with toll roads and or toll road systems/networks?
19. Are there any other transportation planning agencies (e.g., MPOs) in your state that have measured the EJ impacts of toll roads/systems?

The first question was whether the DOT has measured/are measuring EJ impacts of a (planned) toll road or toll road system/network? If the answer to this question was no, then the study team recorded the information and asked no further questions.

In some cases, states had toll road facilities, but these states did not conduct any EJ assessments. Therefore, they were not able to answer the subsequent questions. In these situations, survey questions were asked where possible to try and get a full understanding of what had been done in terms of EJ analysis. The last question was subsequently added to ensure that all the relevant individuals who may be able to provide

insight were consulted. Follow-up and clarification questions were also asked as necessary during the telephone surveys.

3.2.3 Results

Forty six states were surveyed to determine the state-of-the-practice with respect to how DOTs, MPOs, and RMAs have defined a toll system, identified EJ impacts, measured EJ impacts, addressed challenges, and effectively communicated with impacted EJ communities. A number of attempts were made to interview the remaining three states, and while contact was made with DOT representatives, no answers to the survey questions were received. Of the 46 states interviewed, 25 had no toll roads[11]. Nine states have toll roads, but have not conducted any type of EJ analysis. This may be because the toll road was either built before the Executive Order and NEPA were enacted, or because it was built and funded by a private company. Four states have considered EJ in their toll road analysis, but have not established any formal methodology for measuring EJ impacts for toll projects. Eight states have done some type of limited EJ analysis, and some have an established methodology for conducting an EJ impact analysis of toll roads. Some of the states, however, have focused mainly on public outreach paired with a demographic analysis to understand the impacts that may occur to EJ communities. Others have utilized the FHWA Noise Model, Geographic Information Systems (GIS), and four step travel demand model as tools to aid the DOT in measuring either qualitatively or quantitatively the impact on EJ communities. Typically, the number of displacements and noise impacts are the only impacts measured. Table 3.1 outlines the results of the state-of-the-practice surveys.

A brief summary of the interview results is included in the Appendix of this report.

[11] Some may have a toll bridge or ferry, but not a toll road.

Table 3.1: DOT Survey Results

No Toll Roads		Toll Roads, No EJ Analysis	EJ Given Consideration	Limited EJ Analysis
Alaska	Nebraska	Alabama	Minnesota	Colorado
Arizona	Nevada	Georgia	Mississippi	California
Arkansas	New Mexico	Kansas	Pennsylvania	Delaware
Connecticut	North Dakota	Massachusetts	Virginia	Florida
Hawaii	Oregon	New Hampshire		Illinois
Idaho	Rhode Island	New York		New Jersey
Indiana	South Dakota	Ohio		North Carolina
Iowa	Tennessee	Oklahoma		Washington
Kentucky	Utah	West Virginia		
Louisiana	Vermont			
Michigan	Wisconsin			
Missouri	Wyoming			
Montana				

3.3 CONCLUDING REMARKS

It is clear that the interviews conducted as part of this study did not yield all of the information that was desired. There seems to be little consensus on the answers to these questions. Most of the states battle with the same questions and issues that have been identified in this research project. In terms of potential analytical tools proposed in TxDOT Project 0-5208, very few are utilized by any transportation agency in their analysis of EJ impacts. For example, the travel demand model was occasionally used to measure the level of service on potential non-tolled alternatives, and the FHWA Noise Model has been used to estimate the noise impacts of a proposed toll project. The next chapter presents eight case studies, which demonstrates the methodology and analysis tools employed by those states that have attempted to assess the EJ impacts of toll roads.

CHAPTER 4: CASE STUDIES

This chapter highlights the salient findings of eight case studies that were conducted to understand the methodologies and analysis tools used by agencies that have considered the EJ impacts of toll roads. Eight states (i.e., California, Colorado, Florida, Illinois, New Jersey, North Carolina, Pennsylvania, and Washington) presented very useful information as to the approach adopted. Therefore, these case studies exemplify the extent of the EJ analysis undertaken in current practice. Each case study provides background information on the type of analysis typically done by the state agency, the methodology used for a specific project outlined, and the impacts measured. Some of these case studies illustrate the quantitative elements of the EJ impact analysis conducted. Others demonstrate that many states have toll projects that are relatively minor in scope, for example, modifications to an interchange. However, some case studies show that most states rely on public outreach to determine what types of impacts EJ communities will experience.

4.1 CALIFORNIA DOT: I-5 NORTH COAST MANAGED LANES[12]

4.1.1 Background

The types of impacts that are measured in an EJ analysis by the California DOT can include benefits, such as reduced congestion and emissions, reduced border wait times, and increased border crossing choices. The impacts were measured for the proposed new State Route (Tollway) and the new Port of Entry. The approach used to measure these types of impacts considered value pricing studies, traffic studies, and public outreach which included focus group surveys. Some of the challenges faced in this outreach process included a low response rate to mail-out surveys and low turnout at public meetings to receive EJ community input. There were also challenges in terms of obtaining the necessary demographic data at a level that was specific enough. These

[12] This case study summarizes information that was obtained from the I-5 North Coast Managed Lanes Value Pricing Study, which was done by pbConsult for SANDAG in April 2006. The document is available at: http://www.sandag.org/uploads/publicationid/publicationid_1227_5523.pdf.

challenges were addressed by attempting alternative survey methods, such as intercept surveys, focus groups, stakeholder interviews, and using more language-appropriate materials during public outreach.

One toll road was opened in 2007, which caused very few homes to be impacted, none of which belonged to EJ communities, and most of which belonged to fairly affluent households. It is located close to the Mexican border, and alternate routes are available. Because communities often dubiously view noise impact results and studies for projects, noise testing was done when requested for segments of the I-5 project[13]. Caltrans was concerned that the I-5 Managed Lane project could have a direct impact on low income housing, so close attention was paid to this when considering alternatives. During surveys, individuals were asked whether they use transit, because revenues could potentially be used to improve transit systems in the nearby areas. During the public outreach process, the MPO conducted random telephone surveys, and also posted notices and distributed these to the churches in neighborhoods. Flyers were also posted containing information about future public meetings.

4.1.2 Methodology

The I-5 North Coast Managed Lanes Value Pricing Study was conducted to determine whether different toll scenarios are feasible solutions to maintaining mobility on four of the added lanes on I-5. Part of this study evaluated tolling equity and discussed ways to achieve tolling equity. An equitable toll system was considered necessary, because users of the managed lanes were anticipated to make both short and long trips. Because of the latter, it was felt that the toll rates may need to be adjusted to reflect the distance being traveled. Typically, toll equity can be achieved by using mile based pricing systems. In other words, the toll rates are a function of the distance traveled by the user. The disadvantage of this type of pricing plan is that it is less effective in roadway demand management. Because shorter trips have lower tolls, there

[13] For another managed lane project, no direct impacts, except noise, were predicted. A great deal of upfront public outreach was conducted for this managed lane project with community groups, churches, and neighborhood grocery stores.

would be a very low disincentive to use the managed lane facility. In a "flat rate" tolling system, users are charged the same rate regardless of trip length. This pricing system is more inequitable, but is more effective in reducing shorter trips. It therefore encourages longer trips to be made. Finally, a "segmentedly-skewed time-of-day" pricing system[14] was proposed. It was considered to be equitable in delivering a constant value versus cost of time saved in each trip. Although this pricing type is not regarded as typical, it has been viewed as a "fair way" of pricing both accessibility and mobility.

An enhanced version of the San Diego Association of Governments (SANDAG) regional travel model was used to generate traffic forecasts for the I-5 North Coast corridor. The model was enhanced to analyze high occupancy vehicle (HOV) and high occupancy toll (HOT) demand in the San Diego region. In essence, the mode choice component was enhanced to account for attributes that affect HOV and HOT demand. This mode choice component was calibrated against observed data. The mode choice of low income users are sensitive to cost, while high income users are less sensitive to cost and therefore more likely to use the toll facility. The TDM predicted the number of trips by mode, and then assigned each mode's trips to the highway network. The resulting unadjusted volumes (i.e., number of trips) were used in the revenue analysis. One of the key assumptions is that all SOVs that are required to have a transponder were actually equipped with a transponder. However, the fact that some vehicles may not have a transponder or some users may not have a valid account for payment was not accounted for. Another assumption was that HOVs did not require a registered transponder to use the toll facility.[15] While the results of this model were useful in assessing the toll revenue of alternatives, it did not address how low income users would potentially use the facility in the future.

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[14] Segment tolls are tolls charged by segment of the toll road between each major access point. These charges can also vary either by time of day, or dynamically based on travel demand.

[15] On another express lane facility in California, HOV users are required to have a transponder even though they do not pay to use the facility.

4.1.3 Public Outreach

The public outreach component of the project comprised stakeholder interviews, focus groups, intercept surveys, and telephone surveys. Twenty four (24) stakeholder interviews were conducted in November and December of 2004 on behalf of SANDAG. The purpose of these stakeholder interviews was to obtain timely public input about the project's policy and operational issues associated with different pricing strategies. These stakeholders represented a variety of residents and freeway users, including: elected officials, operational stakeholders, community/interest groups, environmental groups, the military community, businesses and regional developers, road user groups, and interregional stakeholders. Each stakeholder was interviewed in-person for an hour and was asked questions about a series of topics. These included:

- their opinion of the current traffic conditions,
- their attitude towards the current I-15 express lanes,
- their views/perception of potential operational issues associated with managed lanes on I-5,
- their willingness to pay for using managed lanes and how to use toll revenues,
- attitudes towards proposed pricing strategies,
- their perception of any environmental and equity concerns associated with the project, and
- ideas for future public outreach and market research.

A key finding from these stakeholder interviews was that people were desperate for a congestion solution on I-5. In general, the additional travel option was seen as a benefit the managed lanes were viewed as a potential solution. In terms of equity, the affordability of the toll cost for low income users was a major concern for stakeholders. However, the overall conclusion was that because the toll facility is optional, the equity concerns are reduced. The point was also made that in the future, the time savings may even be worth the toll cost for low income users. Table 4.1 summarizes the responses of the stakeholders on the equity of value pricing.

Table 4.1: Stakeholder Responses on Equity of Value Pricing

Stakeholder Category	Equity Concerns (Number of Responses)
Elected Officials	• Not an issue, because tolls are a choice and HOV is "free" (1) • Equity is an issue and can be somewhat mitigated with premium transit (1)
Operational Stakeholders	• Address equity concerns through community involvement process (1) • Not an issue, because tolls are optional and HOV is "free" (1) • Unfairness of income differential recognized (1) • Address income inequity through other means (e.g., vouchers) (1) • Market mechanism and transit service will promote transit ridership, so not "unfair" (1)
Community & Interest Groups	• Not an issue, because tolls are a choice and HOV is "free" (3) • Equity issues are income-related, not ethnicity related, though there is an overlap (1) • Equity (affordability) is a problem, but transit subsidies could help mitigate (1) • Equal access to managed lanes for all communities is an equity issue (1)
Environmental Groups	• No opinion (1) • Unfairness could be mitigated with appropriate use of toll revenues (1)
Military Community	• Equity issues are income related, not ethnicity related, though there is an overlap (1) • Ethnic communities along alignment might object to impacts of freeway widening, but not value pricing (1) • Not an issue, because tolls are a choice and HOV is "free" (1)
Businesses and Regional Developers	• Only a pure toll road is supportable—everyone pays for the road itself (1) • The only equity issue relates to maximizing access to the lanes for all communities (1) • Rebates to low income people and "free" HOV access will help mitigate equity impacts (2) • If managed lanes help workers get to better jobs, that's a built-in mitigation of the lanes (1)
Roadway User	• Not an issue, because tolls are a choice and HOV is "free" (2) • Society charges for all goods and the benefits help mitigate those costs • More a perception issue than a real issue, since everyone's time is valuable (1)
Interregional Stakeholders	• Both costs and benefits in public and private sector need to be weighed and balanced against each other; equity impacts are mitigated by transit/HOV "free" access and possible alleviation of congestion on main lanes

EJ concerns were also brought up in both focus groups that were conducted. The concern was mostly with the affordability of the tolls and that low income users would

not be able to afford them. Some felt that toll lanes were simply for the rich and for those whose time is regarded extremely valuable. Concerns about toll revenues and how these revenues would be spent were also brought up. One participant felt that the toll revenues should go towards San Diego transportation, while others were wary of the revenues going to a private company. On the other hand, the majority of the other focus group participants believed that the toll facility should be operated by a private company, because that would ensure more efficiency and responsiveness. This group felt that toll revenues should go towards: schools, mass transit, a movable zipper lane, and expanded general purpose lanes. Ways to mitigate the high cost of tolls for low income users were also discussed, and the provision of reduced tolls for these individuals was suggested.

A key finding from the telephone surveys was that there was – in general -- only a small difference between the responses from low income or minority users and general users. Minority respondents were, however, on average more likely to support the project, specifically if a fixed toll was proposed versus a variable toll. Low income respondents were also supportive of using closures to control traffic flow rather than raising tolls. This can be seen in Figure 4.1, which displays the results of the survey question: "Which approach do you think is better – raising tolls or closing entrances?"

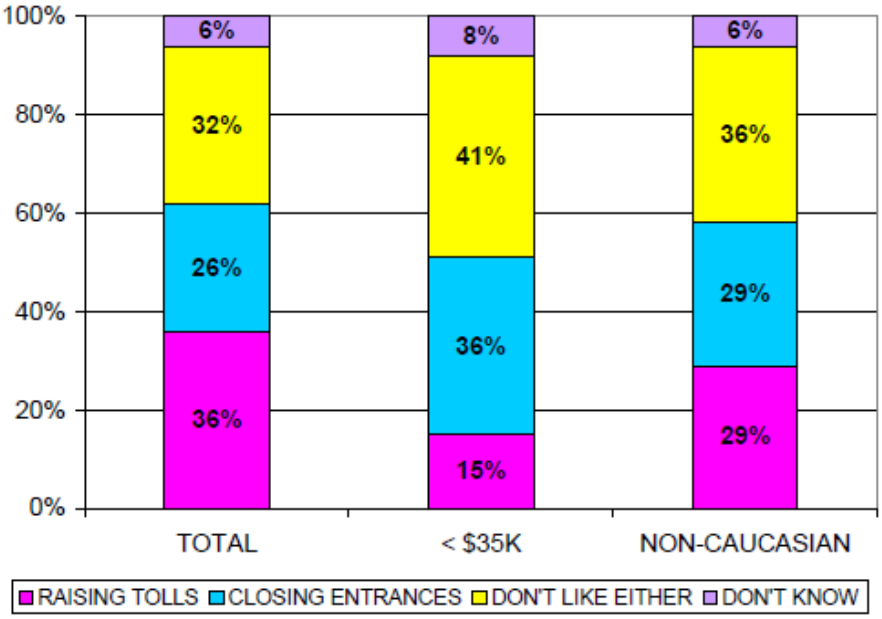

Figure 4.1: Raising Tolls versus Closing Entrances

The survey, however, also found that low income and minority respondents were more likely -- in general -- not to be in favor of either raising tolls or closing entrances. Low income respondents also believed that the addition of the express lanes would increase the noise levels in surrounding neighborhoods. Finally, minority respondents believed that toll lanes are a more effective method of reducing congestion than adding more general purpose lanes.

4.2 COLORADO DOT: US 36 CORRIDOR FINAL ENVIRONMENTAL IMPACT STATEMENT[16]

4.2.1 Background

The Colorado DOT has an established EJ methodology (CDOT, 2005) that (a) evaluates a broad range of alternatives, (b) includes an extensive public involvement

16 The case study information in this section was obtained from the Environmental Impact Statement for the US 36 Corridor, specifically Chapter 4 of this document entitled "Affected Environment and Environmental Consequences." It is available at: https://www.communicationsmgr.com/projects/US36/docs/Section%204.6_Environmental%20Justice.pdf.

process, (c) strives to identify, avoid, minimize, and mitigate adverse effects and impacts, and (d) enhance benefits. The public outreach component is, however, emphasized during the EJ methodology.

CDOT's EJ guidelines were written in 2005 and comprises the following steps:

1. conduct a corridor wide demographic analysis,
2. early public outreach to EJ communities identified,
3. refinements to demographic analysis informed by local knowledge and experience,
4. conduct targeted public outreach,
5. assessment of impacts to all communities,
6. analysis of whether impacts identified would be predominantly borne by EJ communities, and
7. identification of impact mitigation measures (CDOT, 2005).

This following section of the report discusses how CDOT's EJ methodology was applied to the US 36 project.

4.2.2 Methodology

First, the EJ communities in the US 36 project area were identified, as well as communities adjacent to US 36. The EJ impact analysis thus began with a corridor-wide demographic analysis, as well as an early public outreach effort to identified EJ communities. The demographic analysis was conducted at the Census block group level to identify low income and minority communities. EJ block groups were identified by determining whether the EJ population was 50% or greater in a block group, or if the percentage of minority or low income communities was meaningfully greater than the minority or low income population percentage of the general population for a relevant geographic unit of analysis. Low income households were defined as those households with an income at or below the U.S. Department of Health and Human Services poverty level. Adjustments were made to the demographic analysis given local knowledge and experience after the initial public outreach efforts. The area identified with the highest

minority and low income households in the project area was the Adams Segment. All the project alternatives were projected to impact the communities in the area. This segment can be seen in Figure 4.2, which illustrates the project area, the US 36 corridor, and the percentage of minority populations in the project area.

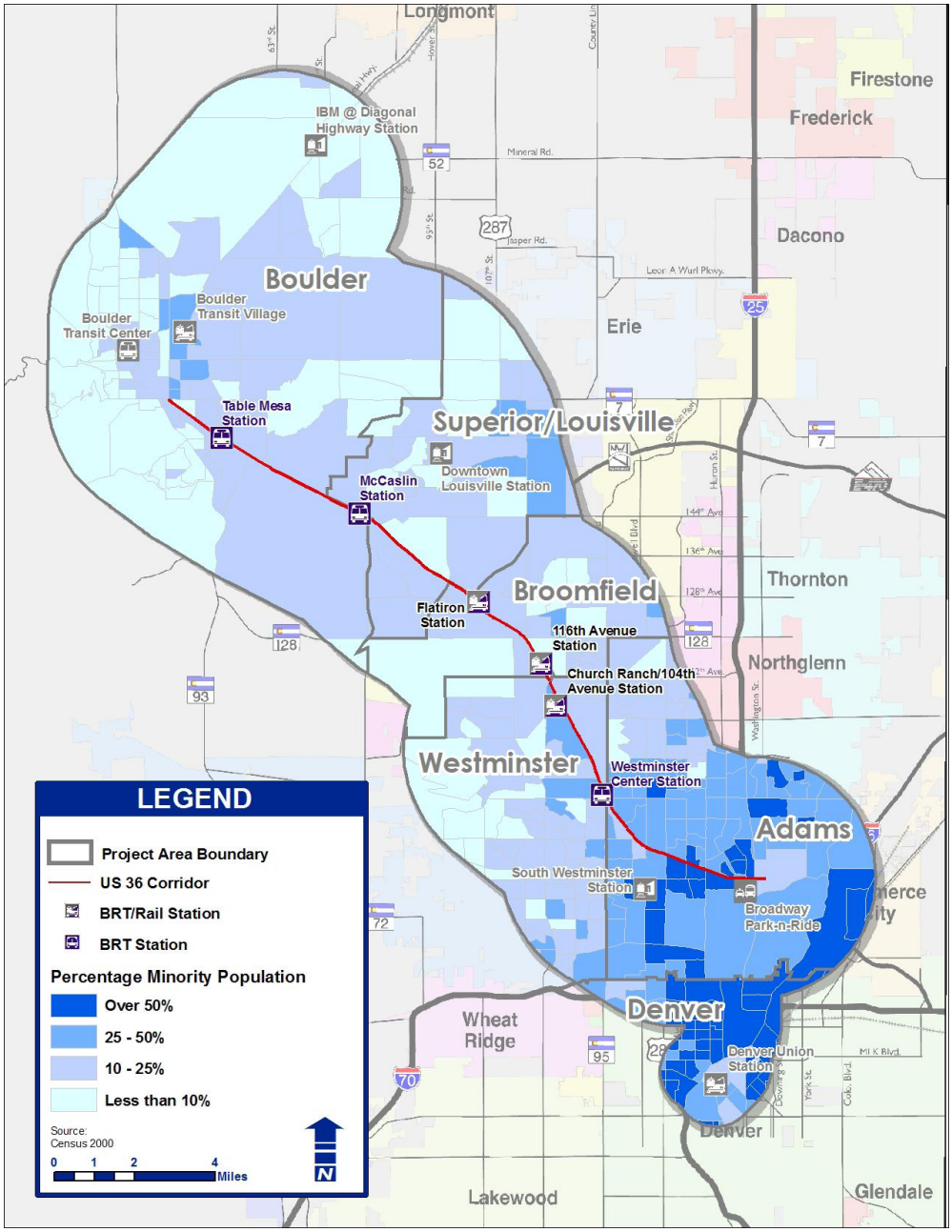

Figure 4.2: Minority Populations in Project Area

The darkest block groups contain more than 50% minority populations. The lightest block groups contain less than 10% minority populations. A similar type of demographic analysis was done for low income populations.

4.2.3 Impact Analysis

According to the CDOT guidelines, a disproportionate adverse impact is defined as:

1. "an impact that is predominantly borne by minority populations or low-income households" or
2. "an impact that will be experienced by these populations in a way that is appreciably more severe or greater in magnitude than would be experienced by non-minority or non-low-income populations" (CDOT, 2005).

A focused and proactive EJ outreach program was also conducted to keep the public informed and to incorporate ideas (see Section 4.2.4).

Once the demographic analysis was refined and the potentially impacted segments of the project area were identified, an impact analysis for all possible alternatives was conducted. The analysis balanced potential negative impacts with potential benefits, such as improved safety, access to transit, or mobility along a corridor. The following impacts were expected to have the greatest effect on EJ communities in the corridor: right-of-way (ROW) acquisition and associated relocations, reduction in parks and open space, visual impacts, noise, and construction impacts. The direct and indirect impacts were considered for various alternatives. The preferred alternative, i.e. the Combined Alternative Package, consisted of a combination of managed lanes, auxiliary lanes, and bus rapid transit. This alternative caused fewer relocations and acquisitions than the other two alternatives (i.e., 41 versus 171 or 172 for the two other alternatives, respectively). Also, a lower percentage of households in the Adams segment would bear the effects of residential relocations than for other alternatives. Mitigation measures were developed to minimize construction impacts, such as early notification, relocation assistance, and coordination with housing assistance programs.

The number of businesses required to be relocated in the Adams segment was also fewer for the preferred alternative. The closing of access from two existing highways to the Adams segment was also analyzed as a potentially negative impact to businesses. The community felt that this loss of access could cause job losses, a reduced customer base for businesses, and lower the desirability of the area for future development, therefore lessening the viability of commercial land uses in the area.

The preferred alternative also required the acquisition of approximately 0.6 acres of parks and open space from EJ communities. However, this impact was not expected to be greater for EJ communities compared to the general population along the US 36 corridor. Visual impacts would also result from the preferred alternative. However, the latter would be less severe for the preferred alternative compared to the other alternatives, because roads would be widened in fewer locations.

Construction of the preferred alternative would impact 329 low income households and 2,288 minority individuals, who live within 300 feet of the project improvement areas. These residents will be exposed to noise, dust, visual degradation, and traffic congestion as a result of construction. To minimize some of these impacts, it was expected that permanent sound walls would be installed prior to construction. Construction was also not expected to sever or lessen access to neighborhoods and community facilities. A benefit of the construction, on the other hand, is the direct creation of about 3,000 new jobs in the corridor over a 5 year period. These jobs present potential employment opportunities for minority and low income individuals. The preferred alternative was expected to raise noise levels during peak hours by an average of 2 dBa above existing conditions. However, in the case of the preferred alternative, some of the existing noise walls would be rebuilt along the newly expanded road's edge to reduce the negative noise impacts on adjacent properties.

Indirect impacts were discussed in a qualitative manner. Potential indirect benefits are the economic stimulus resulting from indirect employment opportunities, improved mobility, and transportation safety along the US 36 corridor. On the other

hand, if commercial properties are relocated[17], it would result in a decrease in the sales tax base if the properties were not replaced with comparable ones.

In terms of indirect equity impacts, low income households were the focus of the analysis. Various studies, such as the Quick Ride Program in Houston, TX, were referenced. The findings noted that low income drivers use express lanes and approve of these lanes as much as high income drivers. Even individuals who do not use the managed lanes each time they use the facility will experience benefits when using the "free lanes" due to the additional capacity.

A travel demand model was used to project the 2035 traffic during peak hours. With the implementation of the preferred alternative, the bus rapid transit (BRT) and HOV facilities are expected to experience travel time savings in comparison to the no action alternative over the general purpose lanes due to decreased congestion.

CDOT planned to conduct periodic user surveys following implementation of the preferred alternative to evaluate the tolling impacts. The toll collection method was also considered to determine whether the facility will be considered equitable. Transponders were to be free, but an account had to be established with a predetermined advance payment for each transponder. Access to transponders could thus be an issue for certain individuals, particularly low income users, if they are not able to afford the lump sum deposit or have a credit card. Future technology changes, such as license plate tolling, could provide another option for low income users who could not afford to set up an account that required a prepayment.

Finally, other project benefits included improvements to interchanges and intersections in the project area. Ramps on surrounding highways were to be redesigned to improve connections and reduce backups for merging vehicles. Benefits also include increased access to transit and redistribution of traffic. Particularly for communities in the Adams segment, those experiencing high and adverse impacts from the facility would also benefit from enhanced transit access[18]. Bus rapid transit would provide a more

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17 Property values may also increase in areas where relocations occur.

18 Using transit is typically less expensive than owning and operating a personal vehicle.

efficient service for transit users, and park-&-ride facilities would be transformed into major transit hubs. For example, the Broadway park-&-ride facility would improve access for residents traveling to and from employment and educational facilities in the downtown areas of Denver and Boulder. Transit improvements would also relieve local street congestion. Low income and minority populations were expected to experience increased reliability and mobility benefits from these bus service improvements. The connections between the US 36 bikeway system and the Clear Creek trail system would also be improved. Bikeways would also have direct connections to transit facilities. Finally, a bridge improvement was also part of the alternatives. The bridge improvement would upgrade the bridge structure to adhere with current CDOT standards and provide better pedestrian access and an overall safer operating environment.

It was thus concluded that, for US 36, there will be no disproportionately high and adverse impacts on minority and low income communities. This determination resulted from the consideration of all the impacts and benefits, as well as mitigation measures that were proposed. In most cases, the benefits appeared to outweigh the impacts, and the EJ communities that were affected were small relative to the total population affected by the project.

4.2.4 Public Outreach

Early on in the project, public outreach was conducted to assess the existing conditions and gain an understanding of public opinion regarding the project. Initially, project information was shared in both English and Spanish in local newspapers, on radio, and on television. Public workshops were held and documents that were translated into Spanish were made available. Meetings were conducted with local officials. A project website was created with project information available in English and Spanish. CDOT also conducted meetings with other project teams to identify community leaders or organizations, both formally and informally, who could be contacted to discuss the project. The following questions were explored by the project team:

1. Where do people need to go, and how are they served now?

2. What do you see as possible impacts and benefits of the potential action?
3. What is important about the fabric of this community that we need to pay attention to?
4. What fears and hopes do you have if a station is developed near you? If there is additional traffic or expanded highway facilities?
5. How do people living and working here communicate about local issues?
6. How do they want to keep informed about the project?
7. How would they like to participate?
8. What meetings might we be invited to?
9. What local publications are useful for informing people?

After the initial public outreach and demographic analysis, a focused outreach effort was conducted in each project area segment that had a large percentage of minority or low income households. This type of focused outreach was conducted for the Denver, Adams, and Boulder segments. Focused outreach efforts comprised contacting and conducting interviews with community leaders, groups, or organization representatives. CDOT identified community liaisons to help distribute information to the rest of the community and to accompany them to small group meetings. CDOT also identified businesses that would be potentially impacted that were either minority owned or important to EJ communities. Small group meetings, telephone interviews, public workshops, and neighborhood meetings were also conducted in each project area segment with high percentages of EJ communities. From these outreach efforts, various concerns emerged that were recorded and considered during the development of the alternatives and the preliminary engineering phases. Concerns included: access to affordable public transit to and from major employment centers and health care centers, air quality, noise impacts, transit level of service, land acquisitions, and property value impacts.

4.3 DELAWARE DOT: US 301 FINAL ENVIRONMENTAL IMPACT STATEMENT[19]

4.3.1 Background

An EIS was completed under the NEPA for US 301 in Delaware in November 2007. EJ was considered by examining the location of EJ communities in relation to the project area and in relation to the alternate routes. The analysis focused on the location of EJ communities relative to the project area. No disproportionately adverse impacts were found on EJ communities. Households that were impacted, regardless of income or race, were compensated in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (as amended in 1987). Coordination with environmental agencies, elected officials, community organizations (e.g., low income and minority representatives), and the public was an important component of the public outreach process. No future toll roads are planned and currently no issues or concerns have been raised regarding equity from nearby inhabitants.

4.3.2 Methodology

The project area for US 301 as outlined by the black dashed line is shown in Figure 4.3.

[19] The case study information in this section was obtained from the US 301 Project Development document included in the Final Environmental Impact Statement (EIS). The EIS was completed in November 2007 and is available at: http://www.deldot.gov/information/projects/us301/pdfs/feis/7-chap3b.pdf.

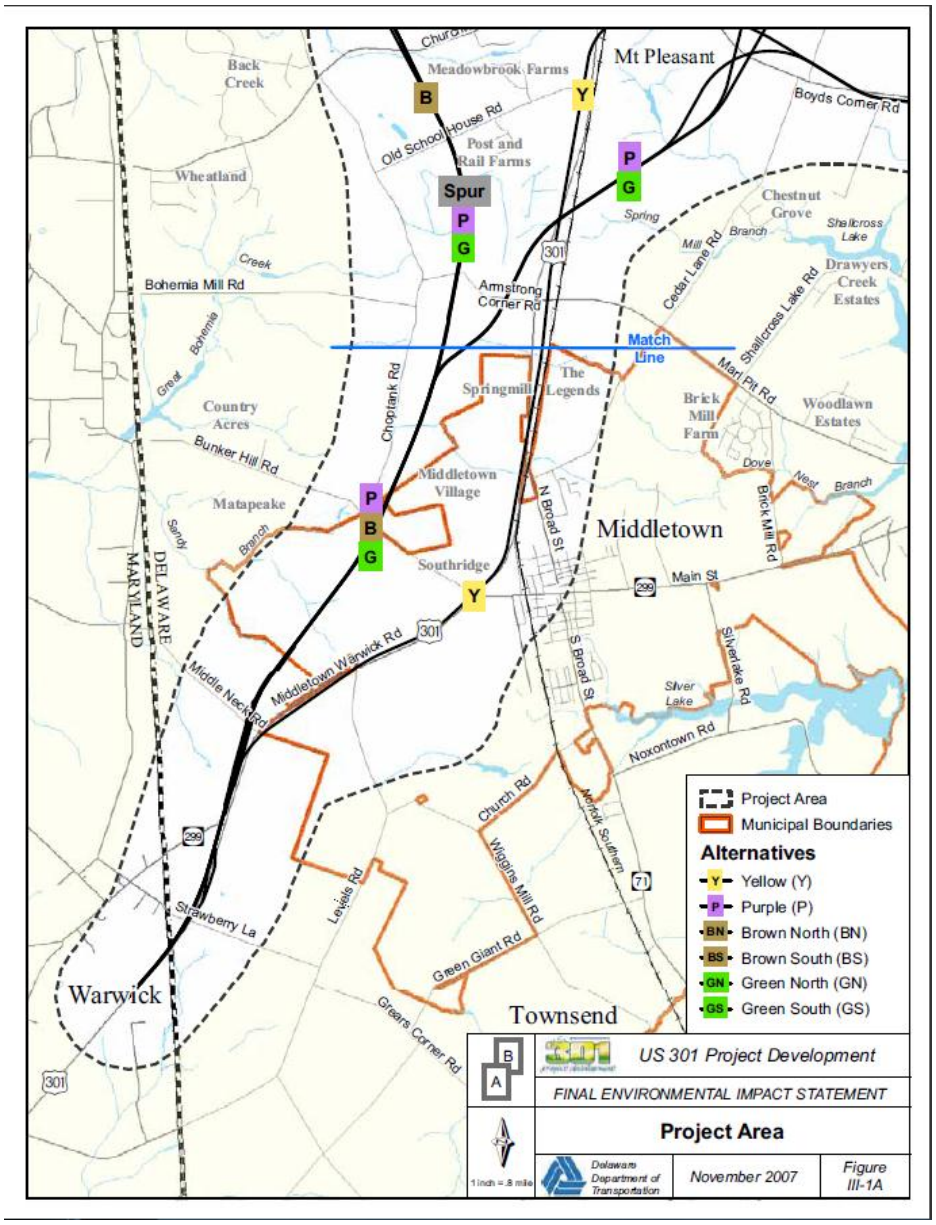

Figure 4.3: Project Area for US-301

The project area consisted of an approximate one mile wide buffer zone on either side of the centerlines of the four alternatives considered. In addition, to simplify data collection, some data were collected for a larger portion of New Castle County than what was included in the project area. The latter also provided a more regional perspective of the area that will be affected by the proposed project.

The social and economic demographics of the project area were described first regionally and subsequently, each of the three incorporated towns was examined individually. New Castle County was the fastest growing of the three Delaware counties in the project area, and accounts for the majority of the state's population, employment, labor force, and wages. Furthermore, the southern planning area of this county has been growing faster on average since 1970, particularly the Middletown-Odessa-Townsend (MOT) planning area. High population growth has thus prompted new developments in the area. Most of this development has been residential, which has resulted in urban sprawl. Having noted this, the majority of the US 301 project area is, however, agricultural (64.2 %), followed by residential areas, and forests. In addition to land use, the current transportation network was defined and available routes were described, including roadways, rail, and transit services.

The demographic analysis for the project area was conducted using Census tract data for minority and low-income populations. Minority percentages for each Census tract were compared to the minority percentages for the state and the county. One Census tract had a greater percentage of African Americans than both the state and county. Another community had a greater Hispanic population than average, which was also growing quickly. The Census tract that held the largest minority percentage also had the highest percentage of individuals living below the poverty level (11.2 %). However, it was noted that there were no high concentrations of minority or low income individuals in the project area. The majority of the impacted project area given the preferred alternative was agricultural. All planned residential development projects in the project area were listed. The preferred alternative would have impacted planned developments in six different areas. Some of these developments have agreed to accommodate a planned US 301 in their development plans, and others indicated that they were willing to work with the DOT. The Delaware DOT would thus continue to consult with these developers to agree on fair compensation for property acquisition.

4.3.3 Impact Analysis

The environmental document concluded that none of the alternatives were expected to have a disproportionately high or adverse impact on minority or low-income communities. However, it was noted that specific low-income or minority households would incur relocation and acquisition impacts under the various alternatives. All impacted persons would, however, be compensated if relocated and would be assisted, regardless of ethnicity or income under the Uniform Relocation Act. Throughout the entire process, coordination with environmental agencies, elected officials, community organizations, and the public was viewed as extremely important.

4.4 FLORIDA DOT: PUBLIC OUTREACH METHODOLOGY

Florida DOT's Environmental Management Office expects a public outreach effort to:

1. *"Be inclusive of all decision-makers and stakeholders. Include as many groups and individuals as possible. A good practitioner knows the community, is proactive, and seeks out people; especially those who will be most affected.*
2. *Have a heavy emphasis on partnering; achieving a mutual understanding of issues and agreeing to work together to find solutions. Communication should be courteous. All opinions should be considered and responded to promptly and respectfully.*
3. *Begin early in the project process and be proactive and ongoing. Appropriate public notice should be given for all major transportation project decisions, by conforming to or exceeding state and federal regulations.*
4. *Be defined, structured, transparent, and clearly delineated at the beginning of the project. Participants should understand the process and be aware of critical decision points where they can provide input.*
5. *Use the most appropriate tools for each audience, by identifying the audience and needs for each project and any potential barriers to communication. Understanding the concerns of the public can reduce the risks of litigation and avoid project delays" (FDOT, 2010).*

By conducting public outreach early and continuously during project development, FDOT is able to identify and understand potential issues. This allows for minimizing and mitigating issues before the final design phase of the project. Extensive public outreach occurs during the project development and environment phases. FDOT considers it crucial that other agencies are involved and cooperate in identifying and addressing potential impacts that affect a community in a study area (FDOT, 2010).

The Environmental Management Office has developed a Public Involvement Handbook (FDOT, 2003) as a resource. Chapter 4 of the Handbook is entitled "How to Involve People" and lists a number of helpful suggestions for agencies conducting public outreach. The ultimate goal of public outreach is to collect valuable information that will assist an agency in making better decisions about a transportation project. However, because the budget for public involvement is not infinite, it is important to use resources efficiently. This often requires creativity involving those who have not traditionally participated and are underrepresented.

The first step is to identify individuals who should contribute to the decision-making process. According to Chapter 4 of the Handbook, "they are:

- *interested in transportation issues;*
- *experienced with transportation systems and related issues;*
- *knowledgeable about the community;*
- *connected to diverse community networks;*
- *possessing a good mix of interests, backgrounds and experiences;*
- *affected by the plan/project; and/or*
- *representative of the full range of segments within the community" (FDOT, 2003).*

Having said that, each community is different and requires the use of different public involvement techniques. Instead of simply contacting "mainstream" community and business leaders, the outreach must gather information from the members of the

community. FDOT created a Community Characteristics Inventory that can be used to develop a "personality" for a specific community.

In the case of EJ communities, FDOT has found that the most effective public involvement is conducted simply by talking with members of the affected community. It is also important to identify which public involvement techniques will actually encourage the involvement of EJ communities. Some of the traditional public involvement techniques, for example, are ineffective in securing the participation of EJ communities. Typically, public meetings are held on week nights, and newsletters and websites are used to communicate information to the public. However, many EJ individuals may not have access to a computer or read a newspaper. They may also not speak English or be able to read. Many work second or third shift jobs and/or rely on transit that may prevent them from attending an evening meeting. Furthermore, a single parent would find it difficult to attend a traditional outreach event if they could not secure care for their child(ren).

Examples of innovative outreach techniques are:

- *"Seek permission from the local school principals to involve social studies students in interviewing their parents to record issues and concerns. This technique can reach non-English speaking or low literacy parents.*
- *Present project/study information at established community meetings, for example, PTA/PTO meetings (the first meeting of each semester and meetings around the holidays are the best attended) or homeowner association meetings.*
- *Identify community focal points, such as senior centers or local grocery stores, churches, breakfast and lunch restaurants, and laundromats where interviews can be conducted in a nonthreatening environment.*
- *Find out when community events, such as festivals, fund-raisers, etc. will be held and attempt to become part of these events.*

- *To document attendance, ask someone to write the names and addresses of people as they arrive. This is effective in making attendees who are unable to write feel comfortable and eliminate embarrassment.*
- *Meetings at churches are highly effective; attendees are put at ease because this environment is familiar. Church dinners provide an opportunity to talk about a plan/project and conduct interviews.*
- *Provide printed material in larger print for the elderly, and create materials on an elementary reading level so people with lower levels of literacy can read them.*
- *Hold one meeting on a transit corridor.*
- *Serve food or snacks to facilitate and encourage participation, if funding is available" (FDOT, 2003).*

In addition, it is also considered important to create a contact network of individuals within the community who have an interest in the project and have knowledge about the community. These may include: elected officials, appointed officials, agency representatives, professional organizations, business community, transportation professionals, environmental agencies, special interest groups, non-profit organizations, residential associations, recreational groups, and tourist industry representatives (FDOT, 2003).

Once the contact network is established, the appropriate outreach method is chosen by FCOT, considering the characteristics of the community. Table 4.2 outlines some strategies, including their benefits and pitfalls, for reaching out to project communities.

Table 4.2: Strategies to Reach the Project

Using Existing Contact Networks			
Purpose	**Benefits**	**Pitfalls**	**Examples**
Identify people Share information Solicit input	Takes advantage of existing resources Builds community relationships and contacts	May miss the traditionally underserved	Professional organizations Chambers of Commerce Community Groups Neighborhood Associations
Develop Organized Outreach Efforts for Large Projects			
Share information Solicit input Monitor effectiveness of program	Builds community contacts and relationships Establishes FDOT and MPO credibility	More appropriate for larger projects or studies Requires dedication of staff and resources	Speakers bureau Oversight committees Project advisory groups
Hold Meetings			
Share information Identify issues Solicit input Build consensus	Effective for reaching large and small groups Establishes FDOT and MPO credibility	Can require extensive planning and resources	Workshops Design charrettes Focus groups Brainstorming sessions Public hearings
Traditional Printed Materials			
Share information	Generally inexpensive Familiar technique	Lacks personal contact May not reach the whole audience	Informational flyers Project newsletters News releases Meeting notices Pamphlets/brochures Newspaper ads
Use a Direct Approach			
Solicit input	Obtains specific information Raises level of importance Timely	Can be time intensive	Facsimile requests Telephone calls Letter requests Surveys Personal interviews
Experiment Using Alternative Media			
Share information Solicit input	Reaches broader audiences Catches the public's attention	Unfamiliar techniques	Radio/television talk shows E-mail & online bulletin boards Public service announcements Automated telephone services

Source: FDOT, 2003

The South Florida Interstate I-95 Express Project report, which summarized the results of various aspects of the project, including the outreach effort, emphasized the need to keep public officials informed about project changes (FDOT, 2009). The accelerated project schedule made it very difficult to keep public officials informed about changes in the plans. It was, however, found important to keep officials informed, as political support for the project may not be maintained otherwise. It was recommended

that routine communication such as email newsletters or alerts on websites may be effectively used to keep public officials informed about project changes. It was also found important to manage the media effectively, especially when dealing with tolled or managed lane projects that may be unpopular. For example, proactively educating the media and responding quickly to any negative information can help manage the media. Alternately, it was recommended that if the public does not respond well initially, a transportation agency adopt a marketing approach in "selling" the project as opposed to simply informing the public about the project (FDOT, 2009).

Implementing innovative public outreach techniques is considered important for tolling projects since agencies must often reach a changing community. During the construction of toll projects, it is considered important to reach out to drivers, who may be confused by unexpected changes to a corridor, which may cause safety issues. Drivers, for example can be reached through highway advisory radio messages. It is thus important to conduct public outreach related to construction milestones. This may require better communication between the contractor and the outreach team, but it will help to better inform drivers about changes during a project (FDOT, 2009).

4.5 ILLINOIS TOLLWAY: I-294/I-57 PROPOSED INTERCHANGE PROJECT[20]

4.5.1 Background

Illinois has a system of toll roads that 286 miles of roadway and runs through 11 counties, essentially all the suburbs in the Chicago area. It was built in the late 1950's prior to the enactment of NEPA, and essentially in the "middle of nowhere." Since the toll roads are already built, the only issues that were raised recently concerned toll rate increases. The Illinois Tollway Authority addresses this concern by maintaining the same charge for I-pass holders and doubling the charge for non-pass holders. The Authority also implemented a circuit breaker program, which provides a discount for

[20] The case study information was obtained from the Environmental Assessment of the I-294/I-57 Interchange Project, which was completed in August of 2008. The document is available at: http://www.dot.il.gov/desenv/Environment/I294I57_EA/Cover.pdf.

eligible EJ families. Currently, not many EJ issues are encountered, because most of the communities affected are middle class.

The Illinois Tollway Authority is not federally funded, but they voluntarily undergo an abbreviated NEPA process. In the case of new infrastructure projects, right-of-way impacts and associated displacements are mostly considered. These impacts are then mitigated accordingly. Outreach meetings are also frequently held with local community representatives.

The Illinois Tollway Authority has also begun to utilize GIS to map the billing addresses of their users and determine the densest locations. This data can be overlaid with Census data to determine whether any locations are EJ communities.

4.5.2 Methodology

The Illinois Tollway Authority prepared an Environmental Assessment for a proposed interchange at I-294 and I-57 in cooperation with the Illinois DOT. The project objectives were (a) to provide an interstate to interstate connection, (b) relieve congestion on local routes, (c) enhance economic development, and (d) enhance other transportation modes in the area. The study area was located in the southern suburbs of the City of Chicago in Cook County, Illinois. A demographic analysis was conducted for the study area to determine whether the percentage of minority or low income individuals in the study area are higher than the percentage of minority or low income individuals in Cook County and the State of Illinois. Four of the six municipalities had a higher minority percentage than Cook County and the state. In 2000, the Health and Human Services Poverty Guideline for a family of four was $17,050. In 2000, the average poverty rate in the study area was higher than the average rate for the county and state. For example, municipalities located north of I-57 had a higher poverty rate than the municipalities south of I-57. The demographic analysis also revealed that the study area included an area characterized by high unemployment. The unemployment rate in the study area varied from 4.3% to 10.9%, whereas the unemployment rate of the county was 4.8%.

4.5.3 Impact Analysis

The preferred improvement alternative would provide a direct connection between I-294 and I-57. This improvement was anticipated to benefit the communities surrounding these two interstates by means of (a) improved access and mobility, and (b) decreased congestion on local roads. The analysis found no notable negative impacts on the surrounding communities, and no neighborhoods would be divided. Increased noise and roadway lighting might, however, impact the surrounding communities and to avoid negative lighting impacts, it was proposed that the lights be directional, focusing away from surrounding communities. Noise impacts were measured considering the FHWA Noise Abatement Criteria (NAC). The noise impacts were measured when the predicted noise level approached, met, or exceeded the NAC for the surrounding land use. A number of proposed noise barriers were analyzed to determine whether they would be effective in reducing traffic noise. Five existing barriers implemented as a part of the I-294 Widening Project were to be removed during construction of the I-294/I-57 Interchange. Twelve noise barriers were analyzed for their cost-effectiveness under the preferred alternative, six on I-57 and six on I-294. The six barriers along I-57 were determined to not be cost-effective and were not recommended. Two of the barriers along I-294 were not considered economically reasonable because they exceeded the cost criteria of $24,000 per benefited receptor. However, the Illinois Tollway Authority decided to construct one of these two barriers because it would replace a 200-foot section of one of the noise barriers constructed as part of the I-294 Widening Project (which was to be removed during construction of the I-294/I-57 Interchange Project). The Illinois Tollway Authority would construct this barrier from toll funds, i.e. not federal funds. This noise barrier was not eligible for Federal funds.

Finally, the majority of the relocations associated with the preferred alternative were going to occur in the two municipalities that have the highest average income and the lowest percentage of minority households in the study area. It was also found that the projected changes in travel patterns will benefit the surrounding communities. Drivers who want to connect between the two interstates would no longer have to use the local

arterials. This decrease in traffic on local roads will improve access to businesses in the area.

4.5.4 Public Outreach

Public involvement was an extremely important component of the Environmental Assessment of the proposed interchange. Three local workshops were conducted with municipality mayors and managers between 1999 and 2000 to determine the preferred alternative. Two additional meetings were also held in 2003. A local coordination meeting was held at the Village Hall in the Village of Posen in 2006 to present an updated project status and to solicit input. Four additional local meetings were held from 2006 to January of 2008. Stakeholders in the study area were also sent questionnaires to gather local input regarding the purpose and need of the project. Two meetings were held with the Posen Park District to discuss the potential impacts of the preferred alternative to that area and to discuss potential mitigation measures.

4.6 NEW JERSEY TURNPIKE AUTHORITY: NJ TURNPIKE WIDENING[21]

4.6.1 Background

The New Jersey Turnpike Authority (NJTA) manages a number of toll roads in New Jersey. No extensive EJ analysis has been conducted for the New Jersey (NJ) Turnpike other than on a project-by-project basis. These projects typically comprise road widening or interchange updates. The NJTA does not use federal funding and are thus not required to undergo NEPA. However, the New Jersey Department of Environmental Protection (NJDEP) dictates the degree to which EJ impacts have to be analyzed by the NJTA in their Environmental Assessments or Environmental Impact Statements.

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[21] The case study information in this section was obtained from the Environmental Impact Statement of the New Jersey Turnpike Widening Project, including Chapter 4 entitled "Environmental Impacts and Mitigation." This EIS was completed in January of 2007. The document is available at: http://www.njturnpikewidening.com/documents.php.

4.6.2 Methodology

In the case of the NJT Widening Project between Interchanges 6 and 9, the project area was defined differently for identifying minority and low income individuals. For the former, the project area was defined as the Census blocks within 500 feet on either side of the project's main right-of-way. To identify low income individuals, the project area is slightly larger because all Census block groups that are entirely or partially within a 500 foot buffer of the Turnpike right-of-way were included in the project area. The reason for the difference in project area was due to the availability of data. Racial information is available at the census block level, whereas income data is only available at the more aggregate census block group level. The demographics of the project area were analyzed and compared with the demographics of the three counties in which the project is located (i.e., Burlington, Mercer, and Middlesex). Low income individuals were defined as those living in households earning an income at or below the poverty level established by the US Department of Health and Human Services. Thirty Census blocks were identified within the project area that had a higher percentage of minority individuals than the county's minority percentage in which they reside. There were only two census block groups identified that had a relatively higher percentage of low income individuals.

4.6.3 Impact Analysis

A disproportionately high and adverse impact exists given evidence of previous disproportionate environmental degradation caused by past major projects or a disproportionate distribution of impacts caused by the proposed project. The potential impacts examined as a result of the proposed project included: displacement, noise, accessibility, and mobility. In terms of previous environmental degradation, local planners were consulted to determine whether there were any major past projects near EJ communities. Specifically, past projects were examined that required environmental reviews under NEPA. It was found that while there had been a number of private developments in the project area, none of these had significant environmental effects. These private projects were also not disproportionately located in areas near EJ

communities and there were no environmentally-sensitive establishments in the project area. In terms of the proposed project, it was anticipated that only five municipalities in the project area would experience residential displacements. None of these municipalities, however, contained high percentages of low income or minority individuals. Because capacity is added and access to the roadway is improved, it was concluded that the proposed project will maintain or improve access and mobility in and around the project area. Also, no reductions or changes to transit services would be made, so the auto, pedestrian, and transit access to community facilities or shopping areas will be unaltered.

To estimate noise impacts, noise levels were measured at 18 locations. At seven locations, it was found to exceed the abatement criteria of 66 dBa. These seven locations were, however, not in areas with high concentrations of low income or minority communities. Finally, no low income or minority residences would be displaced given the proposed project. Therefore, it was concluded that no disproportionately negative impacts would be imposed on EJ communities in the project area and no mitigation was deemed necessary.

4.6.4 Public Outreach

NJTA and its consultants coordinated closely with relevant regional, state, and county agencies during all phases of the proposed project. NJTA met with representatives from 11 of the project corridor municipalities to describe the proposed project. They also met with several private groups and corporations. A total of 37 meetings were held between June 2005 and December 2006 to reach out to all communities that would potentially be affected by the proposed project. No targeted EJ outreach was conducted.

4.7 NORTH CAROLINA TURNPIKE AUTHORITY: WESTERN WAKE FREEWAY[22]

4.7.1 Background

The North Carolina Turnpike Authority (NCTA) is authorized to study, plan, develop, and undertake preliminary design work for up to nine toll facilities in the state. Currently, six proposed toll roads are either in the environmental review stage or the construction stage. Also, as of 2006, the NCTA is authorized to toll sections of existing roadways. A set of criteria has been established for implementing a toll road project. These are:

1. the road must have full access control,
2. the road must have a "free" alternative route,
3. the road must have a high probability of being able to start construction within a reasonable time frame,
4. the road should have demonstrated local support or a reasonable expectation of support for development as a toll facility
5. the road should be deemed financially feasible, using available data and commercially reasonable assumptions, and
6. special consideration should be given to those projects that would play a significant role in the statewide or regional highway system or serve major economic generators.

In terms of EJ impact analysis of toll roads, NCTA combines analysis and outreach. NCTA also makes sure EJ communities really understand all elements of the toll road. Most projects in North Carolina are either "toll road or no road." In this case, it is believed that although EJ communities may not be able to use the toll facility daily, they could still benefit from it occasionally. On the other hand, if there were no road, then no one would benefit. For toll collection, NCTA does not require a credit card for payment, nor is cash collected at toll booths. A transponder can be purchased in the

[22] The case study information in this section was obtained from the Western Wake Freeway Environmental Justice Technical Memorandum. This document was completed in June of 2007 and was provided to the research team by the North Carolina Turnpike Authority.

vicinity of the toll road. The way in which users pay the toll is an important consideration in EJ impact analysis, since this is often a barrier to their ability to use the facility. Other impacts that are considered during and EJ analysis include: available alternate routes, travel times, degree to which people would divert through neighborhood streets, and potential noise impacts.

4.7.2 Methodology

The Western Wake Freeway was a Raleigh outer loop toll project. It is 12.6 miles in length with six lanes and fully controlled access. As per NCTA regulations, the Western Wake Freeway has a non-tolled alternative, which is NC 55. The project area is illustrated in Figure 4.4 below.

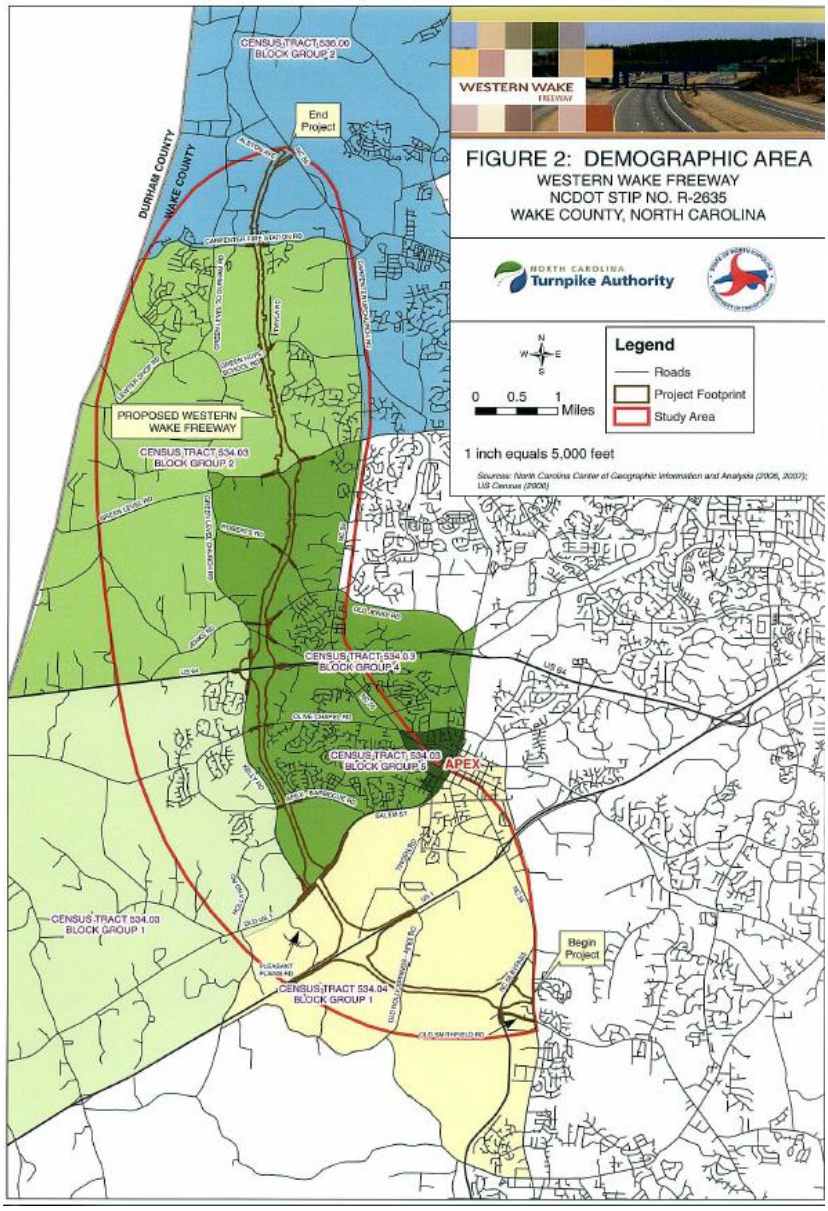

Figure 4.4: Project Area for the Western Wake Freeway

This project area was defined in the Draft EIS prepared in 1999, but no rational explanation was provided for choosing the project area. The communities surrounding the proposed freeway, as well as the existing NC 55, were included in the project area. The highlighted areas represent Census block groups that are affected within the project area.

The EJ populations in the project area were identified using Census data, free and reduced lunch program data from area schools, field observations, and interviews with local planners. Racial data was examined at the census block level, whereas income data was examined at the block group level -- the most detailed available data for income demographics. The proposed project was initially analyzed by NCDOT as a non-tolled facility, but a lack of funding resulted in the project being implemented as a tolled facility by NCTA. The differences in the potential impacts on EJ communities resulting from a toll versus a non-toll facility were evaluated. A Reevaluation Report was thus conducted to ensure that the previous environmental document was still valid.

A community Impact Assessment (CIA) was conducted in which the NCTA analyzed recent effects on the communities from past projects. The CIA was conducted for the community of Feltonsville, which was identified as the main EJ community in the project area. This community is largely comprised of low income African Americans. In addition, smaller minority "pockets" were identified away from the project corridor were not expected to incur any physical impacts from the toll facility. The Feltonsville community was founded in the 1940s as a small rural community, but had been altered due to encroaching industrial development. Initially, the boundaries of this community were delineated through informal interviews with community residents. Community leaders were also identified during this initial phase to aid subsequent public outreach efforts.

Potential effects for the proposed project included visual impacts from the grade separation at NC 55, as well as noise effects. The Design Noise Report concluded that 19 receptors in the EJ community were anticipated to be impacted by noise. These estimates were generated using the FHWA Noise Model Version 2.5. Four residences in Feltonsville would thus have to be displaced because of noise impacts. A potential increase in traffic on Old Smithfield Road in Feltonsville was also noted. This would result from more users accessing the toll road via this free road. Since the Feltonsville community was also located in an area zoned industrial, there was some concern that the

community could face redevelopment pressures as it would become a desirable location for industrial or commercial development.

On the other hand, the Western Wake Freeway could also potentially reroute the through traffic that currently traversed the Feltonsville community. The road also had the potential benefit of providing increased access to major employment centers. Finally, the existing "free" alternative route may not be as direct, but it was expected that the Western Wake Freeway could reduce congestion on the alternative. The MPO travel demand model – i.e., the Triangle Regional Model – estimated an acceptable level of service in 2030 on the alternative "free" route. NC55 would also be widened, resulting in a further decrease in congestion. Furthermore, it was stated that the tolling method would consider low income users and their barriers faced to ensure that the road was accessible to all. No disproportionately high or adverse impacts were thus identified for the project.

Mitigation measures were identified during three group meetings with community members of Feltonsville. A feasibility study was done for the implementation of a noise wall identified in the Traffic Noise Report, but it was determined to not be cost effective. Improvements to Old Smithfield road would be made, including repaving the roadway surface and evaluating signal timing. NCTA also agreed to renovate Feltonsville Community Park and to provide landscaping along the southern side of the toll facility to create a visual buffer between the toll road and the community.

During the Public Involvement component of the project, no concerns were expressed about the tolling aspect of the project. NCTA and NCDOT conducted a Citizens Informational Workshop at the Apex High School as part of the Reevaluation Report[23]. The workshop was announced through media and press releases and advertising in the local newspaper, as well as by sending postcards to about 16,000 people on the project mailing list. An additional 200 flyers were distributed by hand to members of the Feltonsville community.

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[23] Public workshops, public hearings, and small group meetings were also conducted when the corridor was preserved for the proposed project in the early 1990s. Four separate public workshops were held at various stages of the initial project's planning. The mitigation measures that were determined for the proposed toll facility largely resulted from the community concerns that were expressed.

At the workshop, NCTA focused on how the toll changed the community's view of the project. The emphasis during public outreach was thus not necessarily frequency of contact, but rather clarity of the message and educating the public about the proposed toll project. Specifically, the success of the public outreach process for the Western Wake Freeway resulted from sending notices in the mail, posting notices around town, and identifying a local community leader. The community leader assisted NCTA by "spreading the word to the rest of the community". Notices were sent by mail since most of the town's residents were renters. Notices were also posted on actual doors of households to ensure they were received. Small group meetings were held in the evenings after dinner at a local community facility located on Old Smithfield Road in Apex, which typically generated a good turnout. However, not all workshops generated a good turnout. In addition, members of NCTA were available on an "as-requested basis", to meet with community members one-on-one to discuss concerns. NCTA also worked with the MPO to keep municipalities in the area informed and to distribute information to the public.

4.8 WASHINGTON STATE DOT: SR-520 VARIABLE TOLLING PROJECT[24]

4.8.1 Methodology[25]

Washington State DOT has an established EJ methodology to assess the impacts of toll road or bridge projects. In general, determining if a toll is disproportionately regressive depends on:

1. the extent to which low-income consumers use the facility,
2. the quality of travel alternatives, including cost and travel time, and

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24 The case study information in this section was obtained from the Environmental Assessment of the SR-520 Variable Tolling Project. The document was completed in March of 2009 and is available at: http://www.wsdot.wa.gov/NR/rdonlyres/7385DB04-01D7-418C-9BA7-C9A475886E4E/0/D1EnvironmentalJustice.pdf.

25 The following contains information extracted from the Environmental Justice Methodology for WSDOT Tolling Projects document, which is available at: http://www.wsdot.wa.gov/NR/rdonlyres/636C61E7-56BC-4D13-AF20-009182D60EF5/0/MethodologyTollingProjects.pdf.

3. how revenues are used.

WSDOT's current approach to assessing the impacts of a project on EJ populations is a function of their proximity to the proposed project. Typically, the analysis focuses on effects to populations living within a one-quarter (¼) mile to one mile radius of the project footprint. However, besides the physical impacts of highways, these projects also have user impacts. The latter is especially important when considering a toll project. The steps for the EJ methodology are:

1. Determine the study area for:
   (a) affected adjacent populations and
   (b) affected user populations.
2. Collect information on populations protected under EJ guidance for:
   (a) affected adjacent populations and
   (b) affected user populations.
3. Evaluate effects on EJ populations including:
   (a) affected adjacent populations and
   (b) affected user populations.
4. Make a determination.
5. Identify measures to avoid or minimize adverse effects on EJ populations (if needed).

The next section provides information as to how the EJ impacts of the proposed SR 520 variable tolling project were analyzed.

4.8.2 SR 520 Project

The primary purpose of the SR 520 variable tolling project is to alleviate congestion on the tolled SR 520 bridge. The bridge currently carries 110,000 vehicles per day, which is double the capacity for which it was designed. The variable toll will be highest during peak travel periods and there will be no toll booths. The toll revenues will be used for improvements along the SR 520 corridor and for the Evergreen Point Bridge

replacement across Lake Washington. The current bridge is at risk of collapse due to windstorms and earthquakes.

The project area included the users of the Evergreen Point Bridge since the proposed project would not only affect those who live close to the bridge. The limits of the project area[26] were I-5 on the west, SR 522 on the north, I-405 on the east, and I-90 on the south (see Figure 4.5). To define the travel shed associated with the Evergreen Point Bridge, cameras were placed at the on and off ramps during peak weekday hours, midday, and weekends. License plate numbers were recorded and from these, the Department of Licensing provided the addresses that matched each license plate. Users were defined as households that used the bridge on at least one of the days when license plate information was videotaped. The sample was supplemented with a purchased sample of low income and minority resident information in the project area. A transit intercept survey was also conducted to include the opinions of users who do not own a private vehicle.

Low income, minority, and Limited English Proficiency (LEP) households were identified using census data, the survey results, focus group results, and other public involvement activities. For example, by contacting organizations that are involved with low income and minority households. The potential effects of the project on LEP populations were examined to avoid discrimination on the basis of national origin. Census data was used at the block group level to identify both minority and low income populations in the study area. In addition, two Census datasets were used to identify LEP populations at the block group level. The first dataset captured individuals who indicated they speak English "not well" or "not at all". The second dataset reported the languages spoken by residents of the study area. Demographic data on student enrollments in the study area was also used for the 2006-2007 school year to identify minority and low income households since the census data was 9 years old at the time. This data was used to create GIS maps of the locations of low income, minority, and LEP individuals.

[26] This study area was defined in the Transportation Discipline Report.

Figure 4.5 maps with black dots the areas where low income individuals reside using the Evergreen Point Bridge.

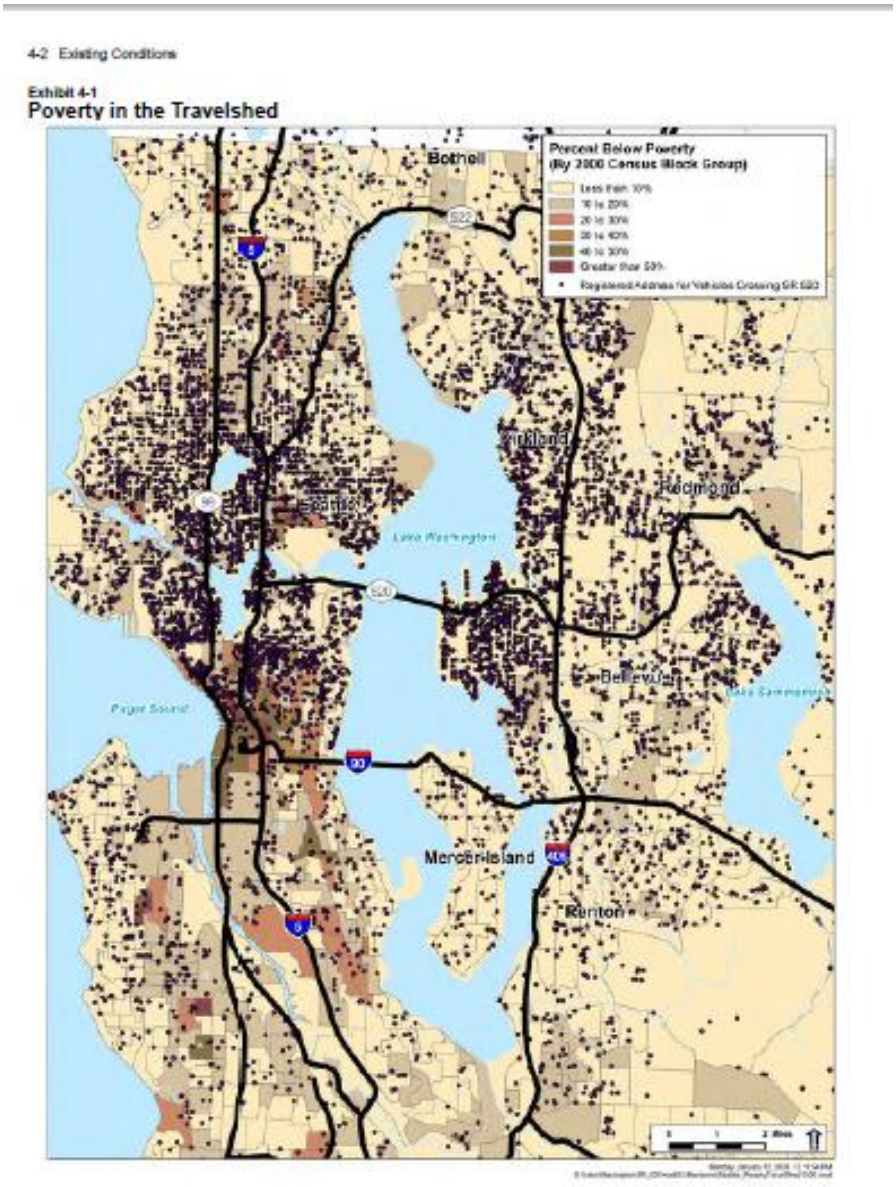


Figure 4.5: Poverty in the Travel Shed

In general, about 9% of the bridge users have an income below the federal poverty level and about 28% of bridge users are non-white. Over 18% of the bridge users spoke a language other than English at home.

A telephone survey of 600 individuals was conducted. These 600 individuals used the bridge two or more days per week. Three hundred of these individuals were protected under EJ regulations. This survey was also conducted in Spanish to reach the LEP individuals[27]. Survey questions included if the individuals would:

- pay the toll and continue to use the bridge,
- choose an alternate route,
- change their time of travel to a time when the toll will be lower,
- use transit or rideshare, or
- forgo the trip altogether (WSDOT, 2009).

The proposed technology for toll collection was also described, and respondents were asked if they would have trouble obtaining a transponder.

4.8.3 Potential Effects

For the proposed project, the "No Build Alternative" meant that variable tolling would not be implemented and the bridge will continue to operate as it did. In the "No Build Alternative", it was anticipated that the traffic volumes were to increase, speeds would decrease, and trip reliability would decrease. Transit speeds across the bridge were also expected to decrease due to the increase in overall traffic volumes. To determine what aspects of the project would benefit or adversely impact EJ populations, the following impacts of the SR 520 Variable Tolling Project were examined:

- traffic and transportation effects,
- air quality effects,
- impacts on cultural resources,
- economic impacts,
- noise effects,
- social effects, and
- visual effects.

[27] No other languages were prevalent in the study area.

Two effects were anticipated to benefit the EJ populations, i.e., increased speeds and trip reliability for both drivers and transit users. The travel demand model used predicted an 11% reduction in traffic volume for 2010 during the morning peak, and a 14% reduction during the afternoon peak for a toll of $2.95. The potential impacts of variable tolling were not expected to affect minority populations differently from the general population. However, it was anticipated that low income or LEP populations would be negatively impacted in three ways. First, the cost of the toll might present a burden to low income individuals. Second, toll costs might also negatively impact social service agencies that depend on the Evergreen Point Bridge to serve low income clients. Third, the toll collection method[28] might exclude low income or LEP populations from using the facility. Toll costs as a percentage of total income was calculated for low versus high income users, assuming the lower income users would not change routes. Many of the low income telephone survey respondents indicated that the toll would impose a burden on them, and that transit was not a viable alternative, because the service was infrequent, unreliable, and took too much time. The non-tolled alternatives were not viable, because they were longer and added trip time, increasing the fuel costs. To validate the latter, WSDOT employees drove these alternate routes identified in the survey during peak hours and compared the alternative route travel time to the time of crossing the Evergreen Point Bridge. Surprisingly, the Traffic Discipline report concluded that alternate, non-tolled routes would not experience a substantial increase in traffic volumes. The traffic model used assumed that most people might try the alternate routes at first, but most would find that the increased time and distance would be more costly both in fuel and lost time. They would thus return to using the Evergreen Point Bridge to get across Lake Washington, either by carpool or transit.

4.8.4 Public Involvement

Focus groups were conducted to collect more detailed information about how tolling might affect EJ communities in the project area. Two separate focus groups were

[28] Bridge users may purchase a transponder and set up an account with WSDOT, or receive a bill after their license plate is photographed while using the facility.

conducted: one consisted of low income bridge users, and the other consisted of non-EJ individuals. Both of the focus groups were conducted in English. Focus group participants indicated in the telephone survey that they would be willing to participate, which is how WSDOT recruited them. A Spanish focus group was also hosted, but no one attended the focus group. Six telephone interviews were thus conducted in Spanish. In addition, the SR 520 Variable Tolling study team also conducted a public scoping meeting, and hosted information booths. Furthermore, the Tolling Implementation Committee conducted interviews with social services agencies and hosted two rounds of open houses: five in July and August of 2008 and three in November of 2008. Placards advertising these open houses were placed on 1,300 King County Metro and Sound Transit buses. The Tolling Implementation Committee also advertised these open houses in four separate newspaper publications in an effort to engage low income and minority populations. A change in access to social and public services, religious organization, community centers, and recreational facilities were examined to determine their importance to EJ populations that depended on the Evergreen Point Bridge. These places tend to serve low income individuals, the elderly, the disabled, or immigrants. These facilities were contacted by the public outreach teams to determine how the implementation of variable tolling on SR 520 would impact them. Public services which transport disabled individuals were also contacted. WSDOT also reviewed the studies from the SR 520 Bridge Replacement and HOV Project, which included interviews with social service agencies during 2004 and 2006.

Other ongoing public outreach efforts included hosting a speakers bureau with presentations on tolling and the new system (i.e., "Good to Go!"), distributing materials in multiple languages, maintaining a website with information about tolling and "Good to Go!", hosting information booths at community events, sharing information in newspapers and on radios, and advertising in newsletters and magazines.

4.8.5 Impact Determination

The census block groups that were adversely affected were identified and mapped using GIS. These areas were overlayed with the data layers identifying the EJ populations. A determination was made whether the variable tolling project would disproportionately adversely affect EJ communities. The following criteria were used to determine disproportionate adverse effects:

1. "Low-income and/or minority populations will predominately bear the effects; or
2. low-income and/or minority populations will suffer the effects and they will be considerably more severe or greater in magnitude than the adverse effects suffered by the general population" (WSDOT, 2009).

From this analysis, it was concluded that low income users will not predominantly bear the effects of the SR 520 project. From the maps, it was concluded that there are not many more bridge users originating from census block groups with high percentages of EJ individuals. However, the cost of the tolls and the purchasing of a transponder would present a higher burden for low income and for LEP individuals. For low income and LEP individuals, respectively, it was concluded that no disproportionate negative impact would be imposed on low income users. The reasons were: (i) a substantial improvement in trip speed and reliability, and (ii) the availability of viable options to avoiding the toll. The latter was partially aided by proposed transit improvements to ensure a more viable alternative for low income users. The potential effects of other projects were also considered, such as the tolling of I-90. This previously non-tolled road served as an alternate route for low income users in this analysis, but its tolling would eliminate this route as a viable alternative.

4.8.6 Mitigation Measures

Since no disproportionate impacts on EJ communities were anticipated during project construction, no mitigation measures were identified. Also, no disproportionate impacts were anticipated on minority populations during project operation. However,

five mitigation measures[29] were outlined to minimize the negative effects of operation on low income and LEP populations. For example, two customer service centers - i.e., one on either side of Lake Washington – would be constructed for drivers to prepay for bridge usage with cash. A payment option that operates like a debit card was also made available so low income users would be able to pay-as-they-go. Transponders or prepaid accounts could also be purchased at a variety of retail outlets, such as grocery stores, convenience stores, and pharmacies. WSDOT would conduct public outreach in multiple languages to reach and educate LEP populations about the new tolling system. WSDOT would also reach out to social service agency workers and educate them about the project and tolling system to enable them to provide the information to their clients. Finally, WSDOT made recommendations to improve the transit system which would increase transit services along SR 520 and offer refunds to social service agencies.

4.9 CONCLUDING REMARKS

From the case study reviews, the conclusion made was that that although some states have used quantitative tools, such as the FHWA noise model, the four step travel demand model, and GIS, no states have used any of the more robust analysis tools or techniques that have been identified during the literature review for this project. In general, it appears that the emphasis has been on using public outreach as the tool to identify, assess, and develop mitigation measures for impacts imposed by toll roads. The use of GIS and the FHWA noise model in quantifying EJ impacts imposed by toll roads has been previously addressed in TxDOT Report 0-5208-R2, entitled "Identifying, Measuring, and Mitigating Environmental Justice Impacts of Toll Roads" (Victoria et al., 2006). The next chapter reviews the travel demand model, its use to quantify impacts on EJ communities imposed by toll roads, and its potential limitations.

[29] WSDOT also recommended that the Washington Transportation Commission implement a statewide policy for the development of mitigation strategies to offset burdens of tolling projects.

CHAPTER 5: ANALYSIS TOOLS – TRAVEL DEMAND MODEL

While the travel demand model has been cited as a useful analysis tool for estimating the impacts on EJ communities imposed by toll roads, its many limitations during certain applications have to be noted. This chapter of the report describes the steps of the travel demand model. The assumptions and limitations of the model are discussed in the context of a case study, as well as the implications that these hold for its use in EJ impact analysis.

Census data is the main input for the travel demand model since it is readily available at a low cost to a transportation agency. Typically, traffic analysis zones (TAZs) are the geographic unit used to project the number of trips made on each roadway segment by each TAZ. A recent study (Duthie et al., 2007) discusses three major challenges associated with EJ impact analyses. The first challenge is the data limitation with respect to the spatial distribution of race and income, spatial distribution of trip ends, trip tables by minority and income classes, inclusion of reliability as network performance measures in addition to more generally used volumes, delays, and travel times. Secondly, usage of several conflicting definitions of equity makes it difficult to determine whether a given project alternative is equitable. Finally, most EJ analysis is currently done at the level of large geographic units like census tracts and TAZs, which makes the classification into protected and unprotected zones very arbitrary. For example, two TAZs (A and B) may contain the same proportion of minority populations. However, TAZ A might have a greater number of minority populations compared to TAZ B, yet still be classified as unprotected zone because of the larger overall population. Each of these challenges is encountered when the travel demand model is used for an EJ impact analysis.

5.1 TRAVEL DEMAND MODELS: GENERAL OVERVIEW

The travel demand model (TDM) is an aggregate analysis tool that predicts the expected demand for transportation facilities or systems. It has, however, occasionally been used by state DOTs or MPOs to assess the impacts on EJ communities imposed by

toll roads. TDMs vary greatly in terms of their level of sophistication, the data that is used, and the output provided. In general, however, the four steps that comprise the TDM are:

- Trip Generation,
- Trip Distribution,
- Modal split, and
- Network Assignment

Trip generation is the first step of the four step TDM. In this step, the socio-demographic characteristics of geographic units (delineated as Traffic Analysis Zones (TAZs)) are converted into trip productions and attractions. The inputs for the trip generation step typically include: population and employment data by TAZ for a base and forecasted year, economic growth rates, and variables that describe current and future land uses, such as number of households and activity centers. These inputs are used to generate trip productions and attractions in each TAZ by trip purpose, e.g., home-based work, home-based non-work, non-home-based, and internal truck trips. Typically, regression curves have been used to estimate productions and attractions. More recent advanced tour based (Castiglione et al., 2006) and activity based (Pinjari et al., 2006) models that attempt to capture individual behavior are probably more suited for EJ analysis. These types of models, however, are somewhat costly to implement, and require a high level of expertise.

Trip productions and attractions by TAZ estimated in the trip generation step are converted into a trip table in the trip distribution step. In other words, the number of trips from each origin TAZ to each destination TAZ is estimated by trip purpose and time-of-day to form a trip matrix in the trip distribution step. These origin-destination (O-D) trip tables are typically generated using one of the following models: a gravity based model, a growth factor model, or an intervening opportunity model. Gravity based models are the most commonly used in the trip distribution step. In these models, travel time and costs are typically represented as friction factors. Therefore, if an attraction TAZ is farther

away from a production TAZ, the friction factor would be higher given an increase in travel time and cost. Ultimately, the trip generation step thus provides the number of trips for each origin-destination TAZ pair by trip purpose and time-of-day (i.e., peak and non-peak hours).

Modal split models are applied to the trip matrices from the trip distribution step to estimate the percentage of trips that use each mode type by trip purpose. A logit model, discrete choice model, or random utility model may be used in this step. The model variables typically account for travel time, cost, reliability, comfort, availability of transit, and household income. The available modes typically include single occupant vehicles (SOV), high occupant vehicles (HOV), and transit. Tolling is often considered during this step of the TDM as a separate mode.

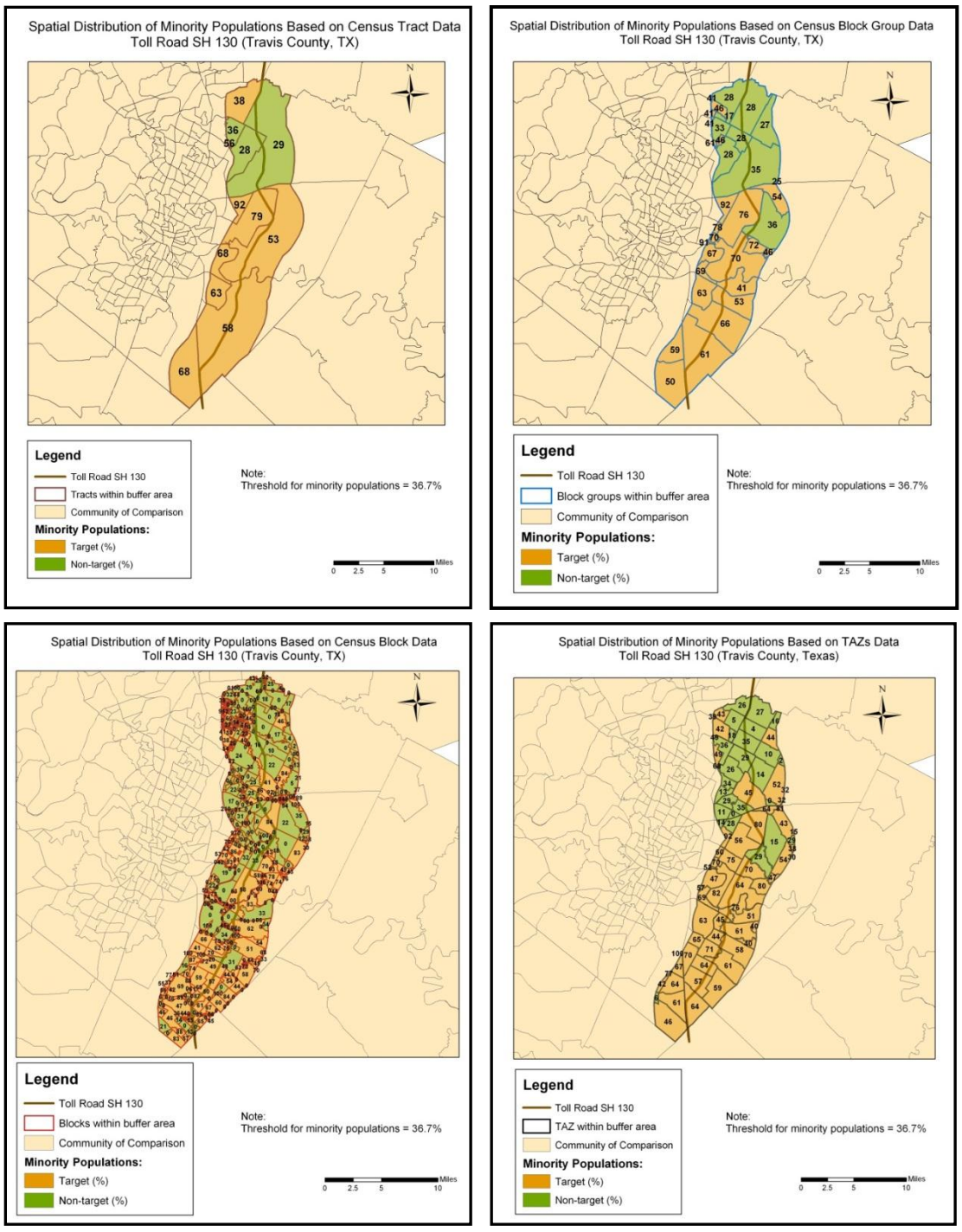
The generated trip tables, separated by trip purpose, mode, and time-of-day, are used as input to this step. Base and future year transportation network information are also needed in this step, as well as an estimate of the value-of-time (VOT). The VOT often represents the generalized cost of a given trip and typically consider the cost of operating a vehicle and the time cost of travel. The toll can thus also be considered as part of the generalized cost associated with a trip. In other words, the toll cost can be included in the VOT as a cost per mile or a fixed amount. The additional cost due to a toll would thus act as a deterrent to use the toll road. Traffic would thus be diverted to the alternative routes until the generalized cost on these routes exceed the generalized cost on the toll road. Network assignment models may include: discrete choice, all or nothing assignment, incremental assignment, capacity restraint, or user equilibrium models. The output of this step comprises the traffic volumes on each link of a transportation network.

5.2 Travel Demand Model Limitations for EJ Analysis

While the TDM has been invaluable in estimating traffic volumes on a transportation network by trip purpose and time-of-day, the model's limitations in assessing EJ impacts imposed by toll roads have to be noted. These limitations mostly

stem from (a) the data that is used, (b) the aggregate level at which the analysis is being conducted, and (c) a lack of suitable indicators/performance measures to measure equity/EJ impacts associated with toll roads. Census data is often the main input for the TDM since it is readily available at no cost to a transportation agency. The data, however, is extremely limited in that it is only recorded every ten years, and becomes outdated within a couple of years. This is because today's populations are more mobile, so that the socio-demographic characteristics of an area can change substantially in a 10 year period. This can be a serious issue when projecting socio-demographic data 25 or 30 years into the future, especially when assuming that future distributions will be the same as the Census base year. According to Duthie et al. (2007), limited data also exists with respect to the spatial distribution of race and income, spatial distribution of trip ends, and trip tables by minority and income classes.

Another limitation of the TDM model in assessing EJ impacts is the geographic scale of the data that is being used. Most EJ analysis when using a TDM is conducted at the TAZ level. However, TAZs are very aggregate geographic units compared to smaller geographic units captured by the Census data. For example, TAZ A may be comprised of 40% minority populations and TAZ B may be comprised of 50% minority populations. However, TAZ A may have a greater number of minority populations compared to TAZ B, yet still be classified as a non-target zone. Figure 5.2 illustrates that the classification of target and non-target minority/low-income populations in a study area changes when the scale of geographic analysis (i.e., tracts, block groups, blocks, and TAZs) changes:



Source: Prozzi et al., 2006

Figure 5.2: Spatial Distribution of Minority Populations Given Different Geographic Scales

Figure 5.2 clearly shows that the course scale of TAZs used in the TDM might overlook minority and low-income communities in the study area. A more complete distribution of EJ communities can be obtained at the block level, and it is therefore considered more appropriate to assess EJ concerns of toll-road projects when (a) the impacts are not uniformly distributed over the impacted area, (b) there is a possibility that low income and minority communities might be overlooked at more aggregate levels of geographic analysis, and (c) the proposed toll project is perceived to be highly controversial.

Uncertainty is also introduced because the TDM often does not include reliability as a variable in the mode choice step, or it underestimates low income individuals' VOT in the network assignment step. In essence, toll road usage can be estimated in either the mode choice step or the traffic assignment step. In the mode choice step, toll roads are presented as an alternative mode, often characterized by travel time and cost. Reliability, however, may be critical for low income individuals for some trips. For example, low income individuals are often employed in jobs that require them to arrive by a certain time. Tardiness often results in job termination. This presents one example where toll road usage by low income individuals may not be adequately captured in the mode choice step. Toll road usage can also be estimated in the trip assignment step. In this step, the toll rate is often converted to represent a time penalty associated with using the route, which affects the trip assignments to the route. Toll road usage is thus ultimately impacted by travel time, distance, and the estimated VOT of potential users. Most VOT estimates correlate an individual's VOT with their hourly wage rate. However, many low income individual's VOT may be higher, because of child-care penalties for late pick-up or welfare-to-work requirements where the penalty may even be job termination. In these cases, the consequences of "being late" will exceed the cost of the toll modeled in the TDM.

Finally, there is no consensus on suitable performance measure/indicators to measure the equity impacts of toll roads. The most innovative "toll road usage" indicator that was measured was the current and projected number of EJ trips on existing and

future priced facilities by TAZ, respectively. However, given the composition of TAZs, it is unclear whether these trips were in effect made by EJ individuals. Also, few trips by EJ individuals on priced facilities do not necessarily equate to "little impact" of priced facilities on EJ individuals. It can also be argued that EJ individuals receive fewer benefits from priced facilities, especially if no alternative routes or modes are available.

5.3 DALLAS-FORT WORTH REGION CASE STUDY

The Metropolitan Transportation Plan for the Dallas-Forth Worth region includes the Mobility 2030 - 2009 Amendment, which presents a system of transportation improvements that must be made to maintain mobility in the region by 2030. This plan addresses the regional transportation needs as determined by forecasting future travel demand, analyzing the existing system, and selecting investment options that would best serve the region's mobility needs. An EJ analysis was conducted comparing the existing system with the proposed transportation system included in the Mobility 2030 – 2009 Amendment. This particular study, however, did not consider the effects of tolling on EJ populations. Therefore, a regional study was subsequently conducted to examine the EJ impacts associated with the expansion of toll roads and managed lanes in the Dallas-Fort Worth region using the Dallas-Fort Worth Regional Travel Model (DFWRTM). For the regional no-build scenario, the existing 2009 roadway network was used along with the forecasted 2030 population demographics. It should be noted that the spatial distribution of the forecasted demographic information was assumed to be the same as the 2000 Census demographic distributions (Lamers, 2010). The regional build scenario utilized the roadway network proposed in the Mobility 2030 – 2009 Amendment, along with the 2030 population demographics. Regional origin-destination studies were conducted for these two scenarios, and the analysis determined whether the potential cumulative impacts from the construction of the proposed priced facilities – i.e. toll roads and managed lanes - would be disproportionately high and adverse for EJ populations. The data used in this analysis was supplied by NCTCOG, and the geographic unit of

measurement was the traffic survey zone (TSZ). The modeling area comprised 4,874 TSZs.

5.3.1 Trip Generation

The socio-demographic data used in the trip generation step included information, such as population, number of households, median household income, household income distribution, household size distribution, and the total number of employees in the basic, retail, and services sectors, as well as for special generators in each TSZ. First, the demographic data was used to predict person trip productions and attractions for various trip types. These trip types were: home-based work (HBW), home-based non-work (HNW), non-home-based (NHB), and internal truck trips (OTH) to and from each TSZ.

The trip generation step of the TDM estimates the total number of trips produced and attracted to each TSZ as a function of the socio-demographic characteristics of the TSZ. This step does not consider any level of service measures, such as travel time or travel cost. This is a limitation because the model cannot replicate the effect of toll increases on trips generated. For example, low income households might make fewer or no trips because of increased travel costs, thus impacting the total number of trips generated by the households. Furthermore, low income households might decide not to undertake recreational trips with their children because of increased toll costs. The trip based travel demand model[30] is therefore not capable of accounting for such behavioral changes at the trip generation step.

5.3.2 Trip Distribution

The number of trips both generated and attracted by TSZs is used as input to the second step of the travel demand model. First, the shortest path from each origin TSZ centroid to each destination TSZ centroid is determined. Trips are also separated into peak and non-peak periods at this time. The number of trips for each origin-destination

[30] Activity based travel demand models model the decision of each individual to participate in an activity type as a function of several individual characteristics as well as level of service factors. These models are more advanced and potentially better suited for EJ impact analysis associated with toll roads.

TSZ pair is subsequently determined given the trip productions, attractions, and roadway skims. The roadway skims[31] are the main input in this module, in addition to other inputs, such as friction factors.

Gravity models[32] are used to generate the number of trips from one TSZ to another TSZ. Currently, only auto travel times are included in the gravity models. Other level of service measures, such as travel times by alternative modes (i.e., transit, walking, or bicycling) and travel costs, are not considered. The second step of the TDM is thus also not capable of replicating trip changes between TSZs resulting from the implementation of priced facilities. Moreover, except for HBW trips, for which four gravity models are used to consider income are used, a single gravity model is used for each of the other trip types (i.e., HNW and NHB). The model therefore cannot estimate the differential impact of toll charges on various racial and income groups. Advanced models like the disaggregate attraction end choice model, developed in Pozsgay and Bhat (2002), and activity based models are more appropriate for EJ impact analysis.

5.3.3 Modal Choice

The next step in the TDM is the mode choice step. The multinomial logit model is used for NHB trips, and nested logit models are used for HBW and HNW trips. The outputs of this step are trip tables by the following modes: drive alone, shared-ride with 2 occupants (SR 2), shared-ride with 3 or more occupants (SR 3+), transit with walk access, and transit with drive access.

The independent variables of the mode choice models are: level of service measures (i.e., travel time and travel cost), zonal land use variables (e.g., population density and employment density), and household demographic variables (e.g., income and household size). The trip matrices are segmented by household income quartile,

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31 A roadway skim is the network path of a trip - using the shortest path - starting at an origin TSZ centroid and finishing at a destination TSZ centroid. The travel time for each of these roadway skims is also included as output in this step of the TDM.

32 Seven different Gravity models are used in this step: four models specific to each income quartile for home-based work trips and one model each for home-based work, non-home based, and other trip purposes. The use of different Gravity models for HBW trips provides some sensitivity to analyze equity concerns.

household size, and vehicle ownership status to address equity concerns. The mode choice models are applied at an aggregate level to each segment separately and attempt to estimate EJ impacts associated with toll roads. However, these mode choice models still do not account for the fact that low income households might have a different sensitivity to toll costs compared with individuals in high income households. Also, travel time reliability is another important factor that impacts mode choice decisions, and that is currently not included in the utility specification.

5.3.4 Traffic Assignment

The last step of the TDM is the traffic assignment step. The inputs for this step are the trip matrices for the AM peak, PM peak, and off-peak hours. The DFWRTM considers four different vehicle categories: drive-alone vehicles, shared-ride vehicles with access to HOV facilities, shared-ride vehicles with no access to HOV facilities, and trucks. For transit assignment, the TransCAD PathFinder algorithm is used to select the most logical path to be taken by transit. A generalized cost function is used for the multi-modal road assignment step. The different vehicle categories have different roadway networks they can access and different VOT parameters. The VOT parameter combined with the impact of travel time, vehicle operating cost, and toll cost provides the generalized cost. The DFWRTM assumes the following VOT values: \$10/hour (\$0.167/minute) for auto-based vehicle classes and \$12/hour (\$0.2/minute) for trucks. The total travel cost on a roadway link is calculated as follows:

$$Generalized\ Cost\ =\ Operating\ Cost\ +\ (VOT) * (Travel\ Time)$$

The operating cost includes the toll costs as well as a constant vehicle operating cost of \$0.75 per mile. The toll cost can be expressed as a fixed dollar value for each roadway link or as a dollar per mile value. The first is used if the toll cost is known for a roadway. Otherwise the toll cost is calculated using the dollar per mile unit toll cost along with the length of the link. These costs are presented in 1999 dollars and toll adjustment factors are used to calculate the cost for future years. The model can also

distinguish the managed lane case where shared-ride vehicles may use the lane for free, but drive-alone vehicles must pay a fee to access it.

As previously stated, a generalized cost function is used considering travel time, operative costs, and VOT. The DFWRTM uses the same VOT values (i.e., $10/hour for auto vehicle classes and $12/hour for trucks) for all households irrespective of their income. However, many low income individuals may have higher VOT for certain trips, because of child care penalties for late pick up or welfare-to-work requirements where the penalty may even be job termination.

5.3.5 Results of the DFWRTM

The output of the traffic assignment step provides traffic volumes for each vehicle class and travel time period on each link of the transportation network. For the purposes of the EJ analysis, the traffic volumes on toll facilities were examined in greater detail. Each TSZ was classified as a "protected" zone or a "non-protected" zone. Protected zones contained more than 50% EJ populations, which comprised minority and low-income individuals, as well as the elderly, the disabled, and female heads of households. Since the origins of the trips on a priced facility are known, the trips originating from EJ zones could be identified. Figure 5.3 illustrates the daily trips originating in EJ zones on existing priced facilities in 2030.

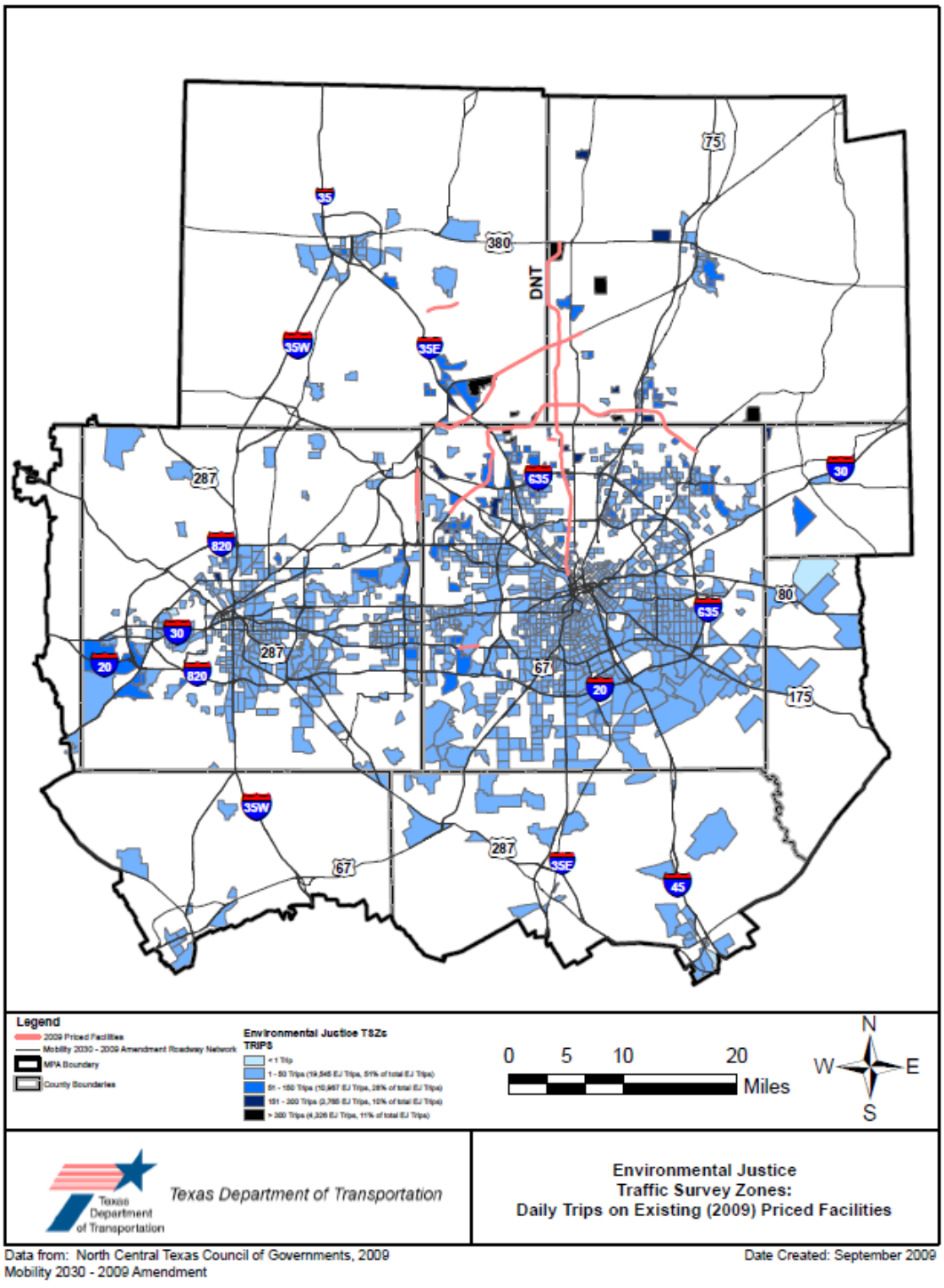


Figure 5.3: Daily EJ Trips on Existing (2009) Priced Facilities

In other words, Figure 5.3 illustrates the daily number of trips originating in EJ TSZs in 2030 under the "no-build" scenario; i.e., the 2009 transportation network. The legend shows that the darker the blue of the EJ TSZ, the more trips originate in that TSZ. In general, approximately 14.6% of daily trips on tolled facilities originate in EJ TSZs. Figure 5.4 illustrates the daily trips originating in EJ zones on the proposed priced facilities in 2030.

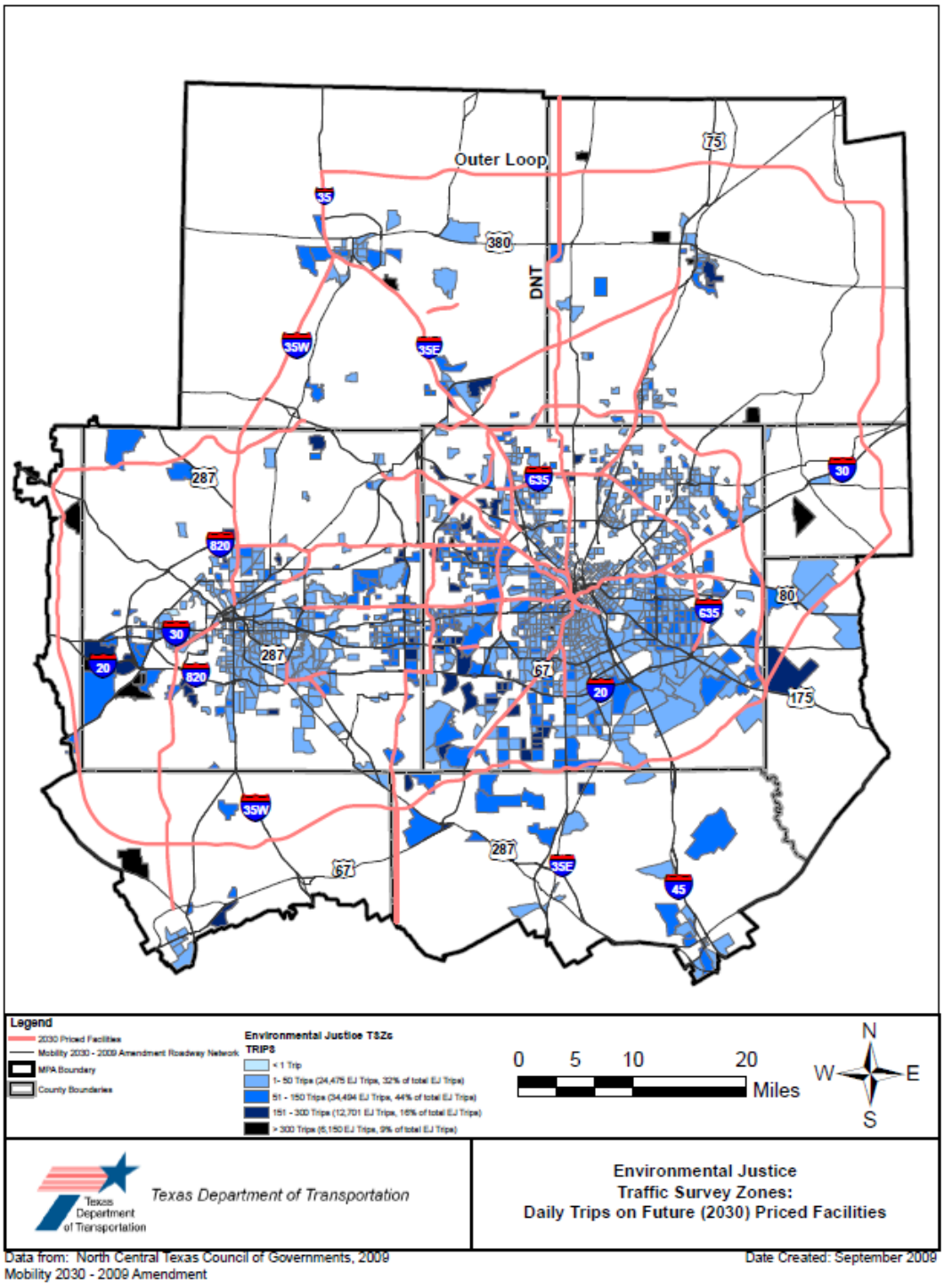


Figure 5.4: Daily EJ Trips on Future (2030) Priced Facilities

In other words, Figure 5.4 shows the number of trips originating in EJ TSZs, assuming the "build" scenario. In this case, approximately 18.1% of all daily trips on tolled facilities are forecasted to originate in EJ TSZs. Comparing the no-build with the build scenario, the total number of trips on tolled facilities will increase 62%. The total number of trips originating in EJ TSZs will increase 102%. It was concluded that while this will cause a potentially larger impact on low income users of tolled facilities, the overall level of service of both tolled and non-tolled facilities will improve with the build scenario in 2030. Therefore, no disproportionate impacts on EJ communities were found as a result of the priced facilities in the region under the build scenario.

5.4 CONCLUDING REMARKS

This chapter provided an overview and illustrative case study of the four step TDM and how it has been used in assessing the impacts imposed by toll roads on EJ TAZs. The limitations of the TDM in terms of (1) the data used, (2) the geographic unit of analysis used, and (3) the lack of consensus/direction as to what constitutes appropriate indicators/performance measures for EJ assessment were also discussed. Given these limitations, the next chapter discusses the use of an effective public outreach strategy as an alternative option for assessing EJ impacts imposed by toll roads.

CHAPTER 6: PUBLIC OUTREACH

This chapter discusses opportunities for developing and implementing effective public outreach within an EJ community based on a clear understanding of the characteristics and travel patterns that could potentially be impacted by a toll road or toll road system. This chapter highlights the characteristics that typically define EJ households, as well as their activity patterns and transportation requirements. It also recommends specific data needed to determine a toll road's impact on EJ households or communities, as well as appropriate public outreach tools or techniques that should be considered when collecting this type of data. Text boxes are used throughout the chapter to highlight how a real-world EJ class was depicted in the recent Darensburg v MTC case in the Bay Area of California (2009).[33] Finally, the chapter includes a case study from Colorado to demonstrate how an effective EJ outreach program was conceptualized and implemented.

> In the Darensburg case the plaintiff class income make-up was: 57% have annual household incomes below $30,000, and over 72% qualified as extremely low income (up to 30% of the area median income) or very low income (31-50% of the area median income).

6.1 CHARACTERIZE EJ HOUSEHOLDS

Typically, EJ households tend to:

- have lower incomes and tend to be minority households,
- be larger with more children,
- have single parents and or female heads of the household,
- have more dependent care responsibilities, such as elderly parents,
- have a first language that is not English,
- have multiple jobs or work shifts that are during nights/weekends,
- live in rental homes[34],

[33] These can be found in Docket 346, the original complaint that began the case, and in the final decision's findings of fact and conclusion of law section at the beginning of the judgement.

[34] This characteristic was determined during the Western Wake Freeway Case Study by the North Carolina Turnpike Authority.

- use transit or older vehicles,
- be less likely to have a landline telephone, and
- spend a greater portion of their income on transportation.

6.1.1 Lower Incomes

Murakami and Young conducted a study entitled "Daily Travel by Persons with Low Income" in 1997 to examine the characteristics of low income households and their travel behavior using the 1995 Nationwide Personal Transportation Survey (NPTS) data[35]. Low income was defined in relation to household size (see Table 6.1) in this study.

Table 6.1: Definition of "Low Income" Households for 1995 NPTS

Number of persons (regardless of age)	Household Income
1-2 persons	Under $10,000
3-4 persons	Under $20,000
5+ persons	Under $25,000
Source: Murakami and Young, 1997	

Murakami and Young (1997) also developed a table that illustrated the racial distribution of the 1995 NPTS sample, as well as for low income and low income single parent households (see Table 6.2). From Table 6.2, it is evident that Black and Hispanic households represent a larger percentage of low income households than their representation in the overall sample. In other words, although Black and Hispanic households represent 11.4% and 7.8%, relatively in the overall sample, they represent 22.5% and 14.2% of the low income households, respectively. Also, Black and Hispanic households represent an even larger percentage of single parent households, i.e., 32.0%

[35] According to this definition of low income, there were 4,721 low income households and 639 single parent low income households out of the total 42,633 households surveyed in the 1995 NPTS. It was also noted that single parent low income households may be underrepresented since the NPTS was a telephone survey (Murakami and Young, 1997).

and 20.2% respectively. The data thus points to the correlation between low income and racial minority households. However, there are also many households that are low income and not minority households. Similarly, there are many minority households that are not low income households.

Table 6.2: Race and Hispanic Origin of NPTS Reference Person (in percent) 1995 NPTS

Race	ALL	Low Income	Low Income Single Parent
Black, non-Hispanic	11.4	22.5	32.0
Hispanic	7.8	14.2	20.2
Asian	1.8	1.5	.9
Other	79.0	61.8	46.8
Total	100.0	100.0	100.0
Source: Murakami and Young, 1997			

6.1.2 Larger Households

In 1998, the average household size of non-Hispanic whites was reported as 3.02 by the U.S. Bureau of the Census, whereas the average household size of Hispanics was 3.92. Hispanics are defined by federal statisticians as individuals who are of Mexican, Cuban, Puerto Rican, and other Hispanic origins. Of these subgroups, Mexican families were recorded to have the highest percentage of families with five or more individuals. In 2000, 33% of Mexican families had five or more members, whereas only 12.1% of non-Hispanic families had five of more members. Many reasons rooted in religion, class, and culture have attempted to explain the high birth rates of Hispanic women. Some have link socioeconomic status (i.e., lower incomes and low levels of education) with higher birth rates. There are some evidence, for example, that low income households (2.73 persons) are larger on average than the general population (2.57 persons), and that single parent low income households (3.28 persons) are even larger (Murakami and Young, 1997).

6.1.3 Single Parents/Female Heads of Households

Murakami and Young (1997) also showed that nearly 90% of low income single parent households are headed by a female. Furthermore, the authors showed that low income single parent households are even larger than low income households (i.e., 3.28 persons versus 2.73 persons).

Table 6.3 illustrates the percentage of families below poverty level, the percentage poverty rate for children under 18, and the percentage of female heads of households by race and ethnicity.

Table 6.3: Population Characteristics by Race and Ethnicity, 1998

	Median Household Income	Families below Poverty Level (in percentages)	Poverty Rate for Children under 18 (in percentages)	Female Head of Household (in percentages)
All U.S.	$38,885	10.0	26.5	15.0
White	$40,912	8.4	10.6	14.0
African American	$25,351	23.6	37.0	46.7
Asian American	$46,637	10.2	18.0	11.7
Hispanic	$28,330	24.7	34.4	23.2
Mexican	$27,088	25.8	35.4	20.0
Puerto Rican	$23,729	31.5	43.5	37.7
Cuban	$37,537	15.6	16.4	15.1
Central/South American	$32,030	18.4	26.6	23.2
Other Hispanic	$30,130	25.0	31.6	34.0

Source: Taylor, 2001

From Table 6.3, it is evident that minorities (i.e., African Americans and Hispanics, specifically Puerto Ricans) have the lowest median household income and the highest percentage of female heads of households when compared to all U.S. Household composition seems to be a factor in the economic

In the Darensburg case it was noted that newer low-floor buses would benefit Ms. Darensburg, because it would make it easier for her to grocery shop, as the buses would *more easily accommodate a grocery cart*, allowing her to reduce the number of trips she makes to the grocery store; thus saving time and money. These buses would also make it easier for her to *travel with her granddaughter*, because low-floor vehicles would more easily accommodate a stroller. Concepcion Chavez argued that low floor buses would make it easier to enter/exit buses with her arthritic knee.

well-being of a household. For example, "… in 1999, 38.4% of Mexican-origin families maintained by women were below the poverty threshold" (Taylor, 2001). Furthermore, low income households tend to be more complex in that often times the households comprises elderly parents or more children. Members of these households therefore tend to have more dependent care responsibilities and often times the elderly or disabled members of the household may require specialized transit, such as "kneeling" buses and sidewalks to access the transit services.

6.1.4 First Language Other Than English

In some instances, EJ households do not speak English. The latter is often the case when the EJ households comprise immigrants. According to Taylor (2001), one million immigrants are added to the U.S. population each year. For example, it has been estimated that almost 80% of the immigrants are from Asia, Mexico, the Caribbean, Central America, and South America. These immigrants likely do not speak English as their first language.

6.1.5 Multiple Jobs

The 2001 National Household Travel Survey (NHTS) showed that low income individuals are more likely to work nights and weekends. To some extent, this is also evident from their travel patterns (see Table 6.4). As can be seen, almost 40% of all off-peak transit trips are made by households earning less than $20,000. As discussed in Section 6.1.3, Murakami and Young (1997) showed that low income single parent households are often headed by females and Blumenberg (2003) found that women are more likely than men to work nights and weekends.

Table 6.4: Peak vs. Off-peak Travel by Income Class

Mode of Transportation	Household Income					
	Less than $20,000	$20,000 to $39,999	$40,000 to $74,999	$75,000 to $99,999	$100,000 and over	All
Total Auto						
Peak	9.4	22.2	33.8	15.9	18.8	100
Off-peak	11.0	24.0	33.1	14.7	17.1	100
Total Transit						
Peak	24.9	20.1	22.2	12.8	20.0	100
Off-peak	39.4	21.0	18.9	5.4	15.2	100
Bus and Light Rail[2]						
Peak	36.8	24.6	20.5	10.3	7.9	100
Off-peak	47.3	21.8	18.2	4.7	8.1	100
Metro/Subway/Heavy Rail[3]						
Peak	8.9	15.3	28.1	11.3	36.5	100
Off-peak	18.1	22.2	21.8	6.0	31.9	100
Commuter Rail[4]						
Peak	3.1	9.9	19.8	25.2	42.0	100
Off-peak	11.7	5.0	18.3	13.3	51.7	100
Taxicab						
Peak	8.8	20.6	14.7	20.6	35.3	100
Off-peak	18.4	15.8	13.3	15.2	37.3	100
All Modes						
Peak	10.5	22.1	33.2	15.7	18.4	100
Off-peak	12.0	23.7	32.6	14.6	17.1	100

All Modes & All Incomes	
Peak	31.2
Off-peak	68.8

Source: Calculated by the authors from the 2001 NHTS.

Notes: In order to isolate urban travel, the sample was limited to residents of urban areas and trips of 75 miles or less.

1. Peak period was defined as 6 to 9 a.m. and 4 to 7 p.m. on weekdays; off-peak included all other times.
2. Light rail also includes conventional streetcars.
3. Metro/subway/heavy rail includes elevated rail and rail rapid transit.
4. Commuter rail includes suburban/regional rail systems and short-distance service provided by Amtrak.

Source: Pucher and Renne, 2003

Because EJ individuals are more likely to have multiple jobs and travel to work during off-peak hours, this may cause difficulties for individuals making trips by transit.

The transit services that are offered during off-peak hours are much less frequent, and completing transfers may also be more challenging as a result.

6.1.6 Rental Homes

During the Western Wake Freeway project in North Carolina, the North Carolina Turnpike Authority (NCTA) observed that many of the EJ households were renting their homes. Typically, lower income individuals cannot afford to own a home. They also may not have the ability to obtain a mortgage because of their income level. Therefore, renting an apartment or home is much more common among low income individuals and families. This is an important factor to consider when selecting an outreach tool. For example, mailed newsletters or flyers may not reach the residents. Posting flyers by hand on the doors of rental properties is therefore a more reliable means of ensuring that the residents receive the information. Because EJ communities may constitute a larger share of renters, these communities also tend to be more dynamic. This means that the demographic profile of an EJ community may change during the planning and implementation phase of a project, therefore requiring ongoing public outreach.

6.1.7 Use Transit or Older Vehicles

Table 6.5 illustrates the modal split (i.e., percentage of trips by mode of transportation) by ethnicity and Table 6.6 illustrates the modal split (i.e., percentage of trips by transportation mode) by income class.

As can be seen from Table 6.5, the private automobile is the dominant mode of transportation for all ethnicities. Having said that, 5.3% of the trips made by Blacks are transit trips (4.2% of transit trips are made by bus or light rail) and 2.4% of trips by Hispanics are made by transit (two percent of trips are made by bus and light rail) compared to 0.9 % of the trips made by Whites are transit trips (0.5% of trips are made by bus and light rail). Similarly

> In The Darensburg Case, Sylvia Darensburg and Virginia Martinez reported that their entire families were dependent on transit for *all their transportation needs* – e.g., get to work, school, college classes, medical appointments, grocery shopping, religious services, social services, volunteer activities, and visiting friends or relatives.

13.2% and 12.6% of all trips by Blacks and Hispanics are non-motorized trips (i.e., walk and bicycle) compared to 9.6% of trips made by Whites are non-motorized trips. Walking is the prevailing mode for all non-motorized transport. About 12.6% of all trips made by Blacks are walking trips and 11.8% of all trips made by Hispanics are walking trips.

Table 6.5: Variation in Modal Choice by Race/Ethnicity

Mode of Transportation	Ethnicity			
	Black	Asian	White	Hispanic
Total Auto	**78.9**	**82.7**	**87.6**	**83.1**
SOV	35.7	33.5	40.1	27.5
HOV	43.2	49.3	47.6	55.5
Total Transit	**5.3**	**3.2**	**0.9**	**2.4**
Bus and Light Rail	4.2	1.8	0.5	2
Metro/Subway/Heavy Rail	0.9	1.1	0.3	0.3
Commuter Rail	0.2	0.3	0.1	0.1
Total Nonmotorized	**13.2**	**12.3**	**9.6**	**12.6**
Walk	12.6	11.7	8.6	11.8
Bicycle	0.6	0.5	0.9	0.9
School Bus	2.1	1.4	1.3	1.5
Taxicab	0.2	0.2	0.1	0.1
Other	0.2	0.1	0.4	0.3
All	**100**	**100**	**100**	**100**
Overall Sample Distribution				
Percent of Total Households	11.3	2.1	74.3	8.7
Percent of Total Trips	11.5	2.7	69.9	12.7

Source: Calculated by the authors from the 2001 NHTS; Pucher and Renne, 2003
Notes: In order to isolate urban travel, the sample was limited to residents of urban areas and trips of 75 miles or less.

1. SOV includes vehicles with driver and no passengers.
2. HOV includes vehicles with two or more occupants.
3. Light rail also includes conventional streetcars.
4. Metro/subway/heavy rail includes elevated rail and rail rapid transit.
5. Commuter rail includes suburban/regional rail systems and short-distance service provided by Amtrak.
6. The Hispanic category was defined to be mutually exclusive of blacks and whites.
7. Rows do not add to 100% because some racial and ethnic categories are not shown.

From Table 6.6 it is evident, that low income households earning less than $20,000 uses predominantly the automobile (approximately 76% of trips), non-motorized modes (17% of trips), and transit (approximately 5% of trips). It is also interesting to note that 45.9% of trips in low income households are made in vehicles with more than one occupant. Many low income individuals will thus share a ride in a vehicle as a passenger (Pucher and Renne; 2003). The high reliance on non-motorized modes also suggests that low income individuals make shorter trips, either because their trip destinations are more concentrated or because they simply cannot access certain destinations. It is also evident that low income individuals utilize bus and light rail transit eight times more than high income individuals.

> In the Darensburg case the plaintiff class income make-up was: 57% have annual household incomes below $30,000, and over 72% qualified as extremely low income (up to 30% of the area median income) or very low income (31-50% of the area median income). Approximately, 61% of the plaintiff class relied on public transit for their everyday transportation needs.

Table 6.6: Modal Split by Income Class (percentage of trips by means of transportation)

Mode of Transportation	Household Income					
	Less than $20,000	$20,000 to $39,999	$40,000 to $74,999	$75,000 to $99,999	$100,000 and over	All
Total Auto	75.9	87.3	88.1	87.4	86.9	85.9
SOV[1]	30.0	37.9	39.2	38.6	37.9	37.3
HOV[2]	45.9	49.5	48.9	48.7	49.0	48.6
Total Transit	4.6	1.4	1.1	0.9	1.5	1.7
Bus and Light Rail[3]	4.0	1.0	0.7	0.5	0.5	1.2
Metro/Subway/ Heavy Rail[4]	0.6	0.3	0.3	0.3	0.7	0.4
Commuter Rail[5]	0.1	0.0	0.1	0.2	0.3	0.1
Total Nonmotorized	17.0	9.7	9.0	9.4	9.5	10.4
Walk	16.2	8.8	8.1	8.5	8.7	9.5
Bicycle	0.9	0.9	0.9	0.9	0.8	0.9
School Bus	1.9	1.3	1.4	1.5	1.4	1.5
Taxicab	0.2	0.1	0.1	0.2	0.3	0.1
Other	0.3	0.2	0.4	0.6	0.4	0.4
All	100	100	100	100	100	100

Source: Calculated by the authors from the 2001 NHTS.

Notes: In order to isolate urban travel, the sample was limited to residents of urban areas and trips of 75 miles or less.

1. SOV (single occupancy vehicle) includes vehicles with driver and no passengers.
2. HOV (high occupancy vehicle) includes vehicles with two or more occupants.
3. Light rail also includes conventional streetcars.
4. Metro/subway/heavy rail includes elevated rail and rail rapid transit.
5. Commuter rail includes suburban/regional rail systems and short-distance service provided by Amtrak.

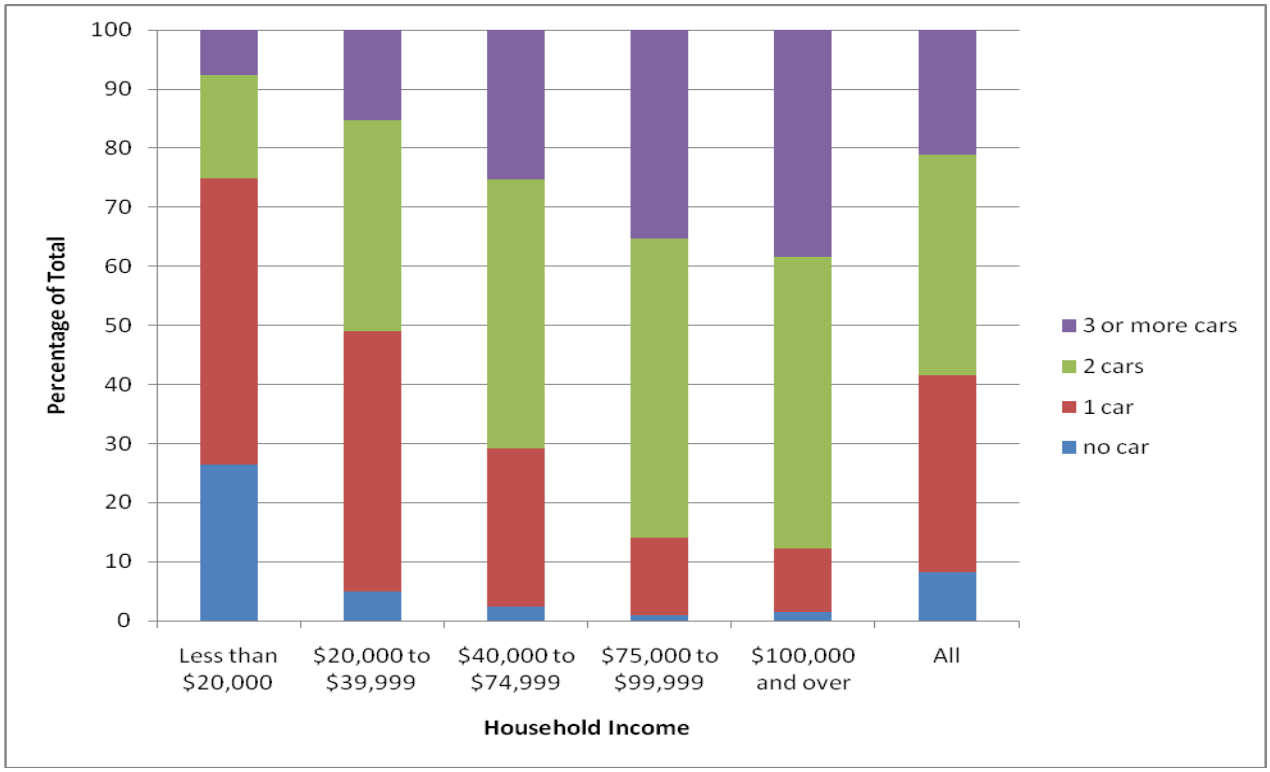
Source: Pucher and Renne, 2003

According to the 1995 NPTS, 26% of low income households and 36% of single parent low income households do not own a car compared to only 4% of non-low income households. This translates into a lower average number of vehicles per household for low income and single parent households compared to all households and non-low income households specifically (see Table 6.7).

Table 6.7: Vehicle Availability

Income	Total	Other (not low)	Low Income	Low Income Single Parent
Avg HH size	2.58	2.57	2.73	3.28
Avg Num of Veh	1.78	1.89	1.16	0.72
Avg Veh Age	8.3	8.1	10.9	10.8
% of HH w/o veh	8%	4%	26%	36%
Vehicles Per HH	1.78	1.89	1.16	0.72
1 Adult HH	0.98	1.09	0.66	0.72
2+ Adult HH	2.11	2.18	1.59	--
Source: Murakami and Young, 1997				

The results from the 2001 NHTS supported the 1995 NPTS analysis conducted by Murakami and Young. Figure 6.1 illustrates the number of vehicles in each household by income category. From Figure 6.1, it is evident that 26.5% of households earning less than $20,000 do not own a vehicle. On the other hand, it is evident that 74.5% of households earning less than $20,000 a year do own at least one vehicle. This reflects the extent to which individuals rely on automobiles for basic transportation needs in the U.S.



Source: Pucher and Renne, 2003

Figure 6.1: Vehicle Ownership by Income Class

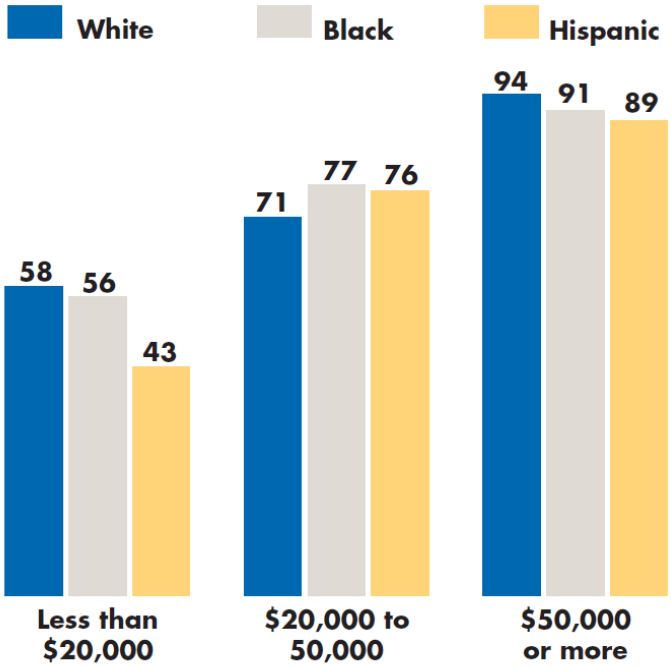
Having said that, the average vehicle age, increases as income decreases (see Table 6.7). The average age of vehicles owned by low income households is almost 10.9 years, whereas the average age of vehicles owned by non-low income households and all households is about 8.1 and 8.3[36] years, respectively. Older vehicles tend to be less reliable, have a higher breakdown probability, and have in general higher operating and maintenance costs. In these cases, low income household members would have to rely on vehicle transportation by friends or neighbors or public transportation.

In the Darensburg case two of the plaintiffs owned an old vehicle, which was inoperable for one or more weeks each month. For example, Jose Casias had to purchase his own car because of inadequate bus service to and from work. He has to incur expenditures on gas, maintenance, and insurance of an old vehicle.

[36] According to the 2001 NHTS, the average vehicle age in Texas is 7.1 years. This may suggest that the average age of vehicles owned by low income households may be lower than the national average reported.

6.1.8 No Landline Telephone

According to Murakami and Young (1997), more than 30% of welfare recipients do not have access to regular phone service. This is an important consideration when planning public outreach efforts, because a landline telephone survey does therefore not necessarily reach all low income households. Having said that, a recent 2010 study, found that 87% minority respondents owned a cell phone compared to 80% of the white respondents. Latinos and blacks were furthermore found to own and use cell phones to access the mobile web at a much higher rate than whites. For example, 69% of African Americans compared to 59% of all Americans go online via wireless with a cell phone or laptop (Nagesh, 2010). Also recent research on internet adoption by income and race showed that while internet use among low income households is still the least prominent, the market penetration for broadband internet access is more than 50% for White and Black low income households (see Figure 6.2). The exception is low income Hispanic households. In this case, approximately 43% of these households have broadband internet access. The literature is thus suggesting that cell phones and internet are not necessarily luxuries that only middle and upper class whites can access. On the contrary, cell phones can be less expensive to own and operate relative to landline telephones and many minority and low income households are becoming what are now known as "cell phone only" households.



Source: Joint Center for Political and Economic Studies, December 2009-January 2010. Based on 603 non-Hispanic Whites, 1,023 non-Hispanic Blacks, and 834 Hispanics

Source: Gant et al., 2010

Figure 6.2: Percentage of Internet Adoption by Family Income, Race, and Ethnicity, 2009

Having said that, it cannot be concluded that a transportation agency can rely on internet distribution of public outreach materials to low income and minority households. Rather, the internet should be used to supplement more traditional outreach methods in distributing outreach materials.

6.1.9 High Transportation Costs

Transportation expenses have been found to be a substantial percentage of the expenditures by low income households (see Table 6.8). From Table 6.8, it is evident that transportation represents on average 19.2% of the expenditures by households receiving no public assistance compared to 15.3% of the expenditures of households that do receive public assistance. Also, it has been found that the transportation expenditures of no worker and single parent households comprise 9.5% and 10.2%, respectively.

Table 6.8: Expenditure by households, including receipt of public assistance and presence of working members and family type

			Households receiving public assistance by:			
	Receive Public Assistance	No Public Assistance	No workers	Some workers	Single parent	Dual parent
Food & Shelter	59.5	46.9	71.7	53.4	69.1	54
Transportation	15.3	19.2	9.5	19.1	10.2	19.6
Source: Family Economics and Nutrition Review 1997 Vol 10, No. 1, page 43 (Murakami and Young, 1997)						

These household characteristics of low-income and minority households have implications for their activity patterns and also the transportation characteristics of these activity patterns. Understanding the activity and travel patterns of EJ households will help transportation agencies to better comprehend the ways in which these households will be impacted by a toll road project, as well as appropriate avenues to reach out to and engage EJ communities. Also, if the heads of EJ households hold multiple jobs, the time of day and venue for outreach meetings and other activities must be carefully selected to accommodate these individuals.

6.2 Activity Patterns Given the Household Characteristics

The Darensburg case emphasized activity patterns that serve "necessary destinations" and "daily needs." "Necessary" trips comprised work, health, school, and grocery shopping trips. These trip types could not be eliminated or substituted with some other form of activity. Social trips, on the other hand, although much needed are not critical for health and survival, but are a critical *social* element that are required for personal and mental health well-being. A survey of the predominantly black users of the MARTA public transportation system in Atlanta reinforced the importance of the work

As an example, Vivian Hain in the Darensburg case noted that she and her family have to ride multiple busses now to get to *necessary* destinations. The case noted that daily needs included shopping for food and clothing, getting to the doctor, and taking children to day care.

trip above all other trip purposes - even on weekends. Other trip purposes noted include: shopping, meals, medical, college, personal, and other school. When asked what an individual would do if MARTA was not available, 42% of respondents said they would not make the trip, 37% said they would drive, and 18% would ride with someone else. A large percentage of the respondents has literally no other option and would forgo making the trip.

Lee-Gosselin and Doherty (2005) listed numerous activity types: personal maintenance, household maintenance, work related activities, family/dependants, vacation, entertainment/recreational, shopping, school, information gathering personal business, serve-dependent, formal group activity, and socialize with friends/relatives. The authors categorized these activity types as "In House" or "Out-of-House" activities. The latter was further classified as "Within Walking Distance" or "Beyond Walking Distance." Walking trips were classified as trip destinations within a predetermined distance, for example a mile or less, from the origin. The non-walking "out-of-house trips were considered critical because the dimensions of these trips are what researchers are most concerned about when conducting EJ analysis of toll road impacts.

From the literature, it is evident that EJ households undertake and exhibit many of the same activity patterns as non-EJ households (for example, going to work, going to school, going to the grocery store, visiting the doctor, dropping and picking kids up from day care). However, because of the characteristics of EJ households (see Section 6.1) the transportation requirements and characteristics of EJ individuals (see Section 6.3) tend to differ from non-EJ individuals. Also, the literature suggests that EJ households often have less choice in accessing activities. For example, a transit dependent EJ individual may have to forgo a trip if transit does not serve the destination or if a ride is not available with a neighbor, friend or family member. In another case, an EJ individual may be required to purchase a vehicle – often an older vehicle that is more expensive to operate – to access employment not served by transit. Also, there is some evidence that suggest that because of the time spend by EJ individuals to access necessary activities, such as work, shopping, and healthcare, there is limited time available for social and recreational

activities. Therefore, EJ individuals could be more restricted in terms of the activities they can access which are not "necessary activities."

6.3 TRANSPORTATION REQUIREMENTS AND CHARACTERISTICS

It is important for transportation agencies to understand the transportation requirements and characteristics of the activity patterns that EJ households engage in since a toll charge may impact some of these travel dimensions. This section of the report highlights some of the travel dimensions of EJ households for a variety of trip purposes, i.e., work, school, shopping, and family, and other recreational trips. These travel dimensions discussed include:

- transportation origin and destinations,
- transportation mode and vehicle occupancy,
- transportation reliability
- travel time, and
- transportation cost.

An understanding of the effects of tolling on these travel dimensions - both positive and negative - are required to determine the impacts on EJ households.

6.3.1 Origin/Destination

The literature revealed that low income households make fewer urban trips per person per day and also travel fewer miles per person per day. Table 6.9 shows that low income households earning less than $20,000 per day, on average made 3.2 urban trips per person per day compared to an average 4 urban trips per person per day for all households[37]. There also seems to be a correlation between income and the number of person trips per day with households earning $100,000 or more making the most trips per person per day (i.e., 4.8 urban trips per person per day). Similarly, there seems to be a

[37] An analysis of the NHTS data showed that the average number of trips per person per day in Texas in 2001 was 2.73 trips. It was also found that about 38.8% of all non-work trips and 21.8% of all work trips in Texas were less than three miles in 2001. On the other extreme, 22.5% of all work trips and 11.6% of all non-work trips were 20 miles or longer. The analysis, however, did not focus on low income or minority households.

correlation between the miles traveled per person per day and income, with low income households earning less than $20,000 traveling 17.9 miles per person per day and high income households earning $100,000 or more traveling 26.9 miles per person per day.

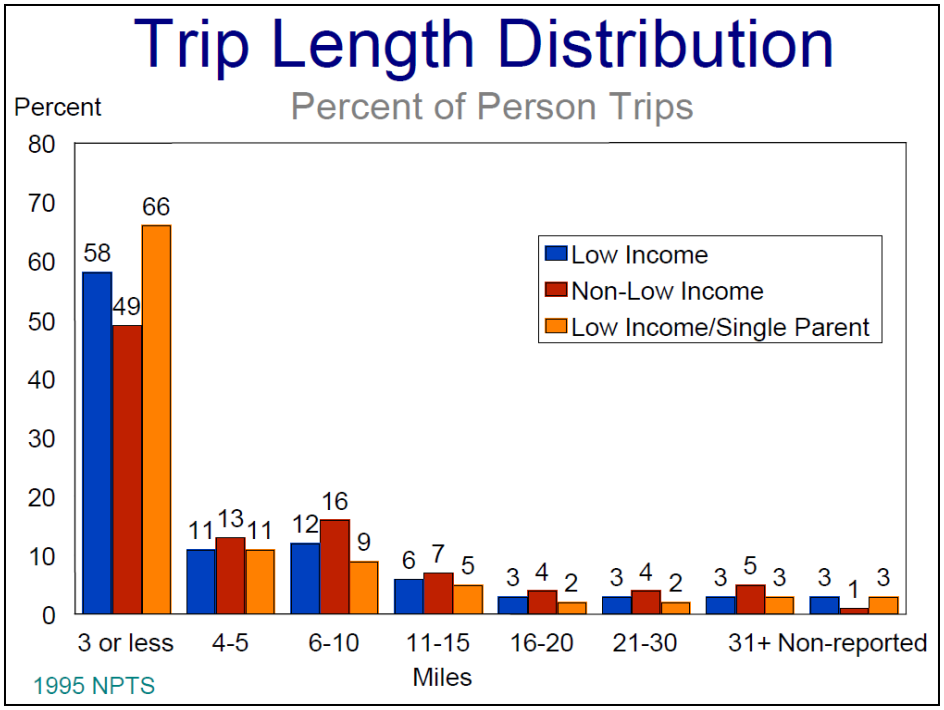
Table 6.9: Daily Travel Per Capita by Income Class

Household Income	Trips per Day, per Person	Miles Traveled per Day, per Person
Less than $20,000	3.2	17.9
$20,000 to $39,999	3.9	26.4
$40,000 to $74,999	4.2	30.2
$75,000 to $99,999	4.3	30.7
$100,000 and over	4.8	31.8
All	4.0	26.9

Source: Calculated from the 2001 NHTS by Mary Ann Keyes, Federal Highway Administration, US Department of Transportation.
Note: In order to isolate urban travel, the sample was limited to residents of urban areas and trips of 75 miles or less.

Source: Pucher and Renne, 2003

Figure 6.3 illustrates the distribution of trip lengths by low income, non-low income, and single parent low income individuals.



Source: Murakami and Young, 1997

Figure 6.3: Trip Length Distribution as a Percent of Person Trips

From Figure 6.3, it is evident that 58% of the person trips by low income households are three miles[38] or less compared to 49% of the person trips by non-low income households. For single parent low income households, 66% of all trips are three miles or less. Murakami and Young (1997) argued that a travel radius of 10 miles covers an area that is approximately 10 times larger than the area that covers a travel radius of three miles. In other words, an

> The Darensburg case noted that inadequate transit service has led to Virginia Martinez and her husband being late for work, and to passing up more attractive job opportunities further from home. Overcrowding and insufficient bus service left their older children with no choice but to walk up to thirty blocks to/from school. Inadequate service has also led to Ms. Hain being subject to discipline at work due to tardiness, and this has put her at risk *for failing to meet Welfare-to-Work requirements*.

[38] The predominance of shorter trips by low income and single parent households may be the result of higher levels of unemployment and therefore the absence of work trips. Pucher and Renne (2003) also argued that it may be because low income individuals typically reside in central cities, which are more concentrated so that these individuals do not need to travel as frequently or as far.

individual's access to job opportunities, shopping, medical facilities and services, and recreational activities may be greatly compromised when his/her travel radius is only three miles. This contributes to a poorer quality of life (Pucher and Renne, 2003).

The data reported is supported by the substantial research that has been done on the travel patterns of welfare recipients to their places of employment. This body of research has shown that, contrary to popular belief, low-income individuals typically are not traveling in the reverse commute direction that is often assumed to occur as a result of the "spatial mismatch" theory. On the contrary, most low income women engage in localized job searches. This is because the cost - both monetary and in terms of travel time - associated with commuting far distances is very high (Blumenberg, 2003). This is especially true for single mothers, whose responsibilities as head of the household are numerous.

> In the Darensburg case, Virginia Martinez's husband could not take a better-paying job farther from home because it required AC transit and BART to reach the location, and the extra fares would have exceeded the increased wages.

6.3.2 Mode and Vehicle Occupancy

Although low income and minority households are much more likely to use transit and other non-motorized modes[39] besides a private vehicle, the majority of these households still rely on private vehicles for the majority of their trips (see Section 6.1.7). The reason being that auto usage is simply more convenient. It facilitates trip chaining[40] – i.e., the combination of multiple errands in one trip – more readily compared to public transit. In many areas of the country, public transit may also not be an option for individuals due to the operating hours of the service, which may comprise a reduced service frequency during off-peak

> The Darensburg case noted that the plaintiffs utilized public transit for night time activities, including access to college classes. Many of the plaintiffs noted that they felt unsafe sitting at bus stops for long periods of time at night.

[39] Murakami and Young (1997) noted that low income workers are twice as likely as non-low income workers to walk to work. The percentage of low income individuals who walk also increases when examining social and recreational trip purposes.

[40] Trip chaining is more common among women.

hours and weekends, and often times no night time service. Even if public transit is available late at night, women may still be disinclined to use it because of safety concerns. Transit may also not be an option that a single working mother could use in an emergency, for example to transport a sick child to the hospital (Blumenberg, 2003), or to use to go to church or attend after-school activities and parent/teacher conferences.

Table 6.10 illustrates the impact that vehicle ownership has on an individual's travel behavior. From Table 6.10, it is evident that households that do not own a vehicle make 19.1% of their trips by transit and 43.5% of their trips by a non-motorized mode, i.e., mostly walking (41.1%). However, when a household purchase a vehicle the percentage of their trips by transit decreases to 2.7% and the percentage of their trips by non-motorized modes decreases to 13.2% (Pucher and Renne, 2003).

Table 6.10: Impact of Auto Ownership on Mode Choice

Mode of Transportation	Total Number of Vehicles in Household				
	0	1	2	3 or more	All
Total Auto	34.1	81.9	88.8	90.5	85.9
SOV[1]	5.2	36.8	36.6	42.5	37.3
HOV[2]	28.9	45.1	52.2	48.0	48.6
Total Transit	19.1	2.7	0.6	0.5	1.7
Bus and Light Rail[3]	14.1	1.9	0.4	0.3	1.2
Metro/Subway/Heavy Rail[4]	4.8	0.7	0.1	0.1	0.4
Commuter Rail[5]	0.2	0.2	0.1	0.1	0.1
Total Nonmotorized	43.5	13.2	8.8	7.1	10.4
Walk	41.1	12.5	7.8	6.3	9.5
Bicycle	2.4	0.7	0.9	0.8	0.9
School Bus	1.5	1.7	1.4	1.4	1.5
Taxicab	1.0	0.2	0.1	0.1	0.1
Other	0.9	0.3	0.4	0.3	0.4
All	100	100	100	100	100

Source: Calculated by the authors from the 2001 NHTS.

Notes: In order to isolate urban travel, the sample was limited to residents of urban areas and trips of 75 miles or less.

1. SOV (single occupancy vehicle) includes vehicles with driver and no passengers.
2. HOV (high occupancy vehicle) includes vehicles with two or more occupants.
3. Light rail also includes conventional streetcars.
4. Metro/subway/heavy rail includes elevated rail and rail rapid transit.
5. Commuter rail includes suburban/regional rail systems and short-distance service provided by Amtrak.

Source: Pucher and Renne, 2003

Table 6.10 also shows that even if a household does not own a vehicle, a substantial percentage of their trips are made by auto. Low income individuals, especially single parent low income individuals, are, however, much more likely to be the passenger in a vehicle than the driver (Murakami and Young, 1997). Many low income individuals will thus ride in a vehicle as a passenger with family, friends, or neighbors. Table 6.11 illustrates the vehicle occupancy of private vehicle trips by income and trip purpose.

Table 6.11: Average Vehicle Occupancy for Private Vehicle Trips (weighted by miles)

	All	Low Income	Other (not low income)
Earning a living	1.16	1.2	1.15
Family & Personal Business	1.77	2.01	1.74
Social & Recreational	2.07	2.48	2.07
Total*	1.59	1.85	1.57
*Note: not all trip purposes shown Source: Murakami and Young, 1997			

For work trips, Murakami and Young (1997) found that the vehicle occupancy of low income individuals is only slightly higher than for non-low income individuals (i.e., 1.2 compared to 1.15). However, for all other trip purposes, there is a noticeable difference between the vehicle occupancy of low income and non-low income individuals. The higher vehicle occupancy of low income individuals seems to support the data that low income households tend to be larger, do not necessarily own a private vehicle, but that a substantial share of their trips are made as passengers in a vehicle. Ultimately, it is important for a transportation agency to understand what modes are used by EJ households in a given area during the planning and development of mitigation measures for a toll road project. For example, if EJ households are dependent on the automobile for their trip purposes, then increased transit services may not be an effective mitigation measure to offset the impacts of increased travel time or costs.

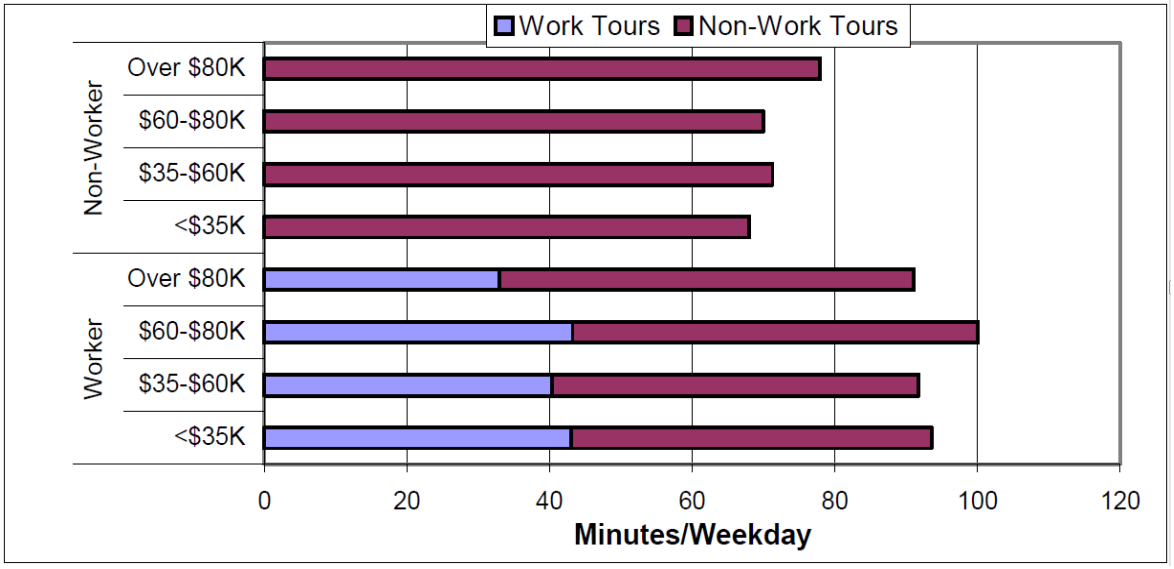
The Darensburg case highlighted how toll revenues, utilized for mitigation, can also create another set of 'equity' issues. In the case the plaintiff class argued that the subsidy they received was five times lower compared to Caltrain riders ($2.78 $13.49 per trip respectively).

6.3.3 Travel Time

Although it has been reported that low income households tend to make fewer and shorter trips, those that rely on transit and walking tend to have longer trip travel times than they would using a private vehicle. For example, low income workers[41] that use the bus would have a longer trip time by bus than by private vehicle as buses must stop to pick up and drop off passengers.

> In the Darensburg case, plaintiffs noted that impacts of the reduced bus service led to a grocery store trip -- that would have taken ten minutes by car -- taking up to 1.5 hours round-trip on the bus.

Figure 6.4 illustrates the travel time spent by trip purpose (i.e., work and non-work) and income category.



Source: McGuckin and Srinivasan, 2005

Figure 6.4: Minutes Spent in Travel for Work and Non-work Tours by Income, 2001 NHTS

From Figure 6.4, it is evident that high income workers (i.e., those earning more than $80,000) spend about the same or more time traveling for both work and non-work purposes than low income workers (i.e., those earning less than $35,000). However, the

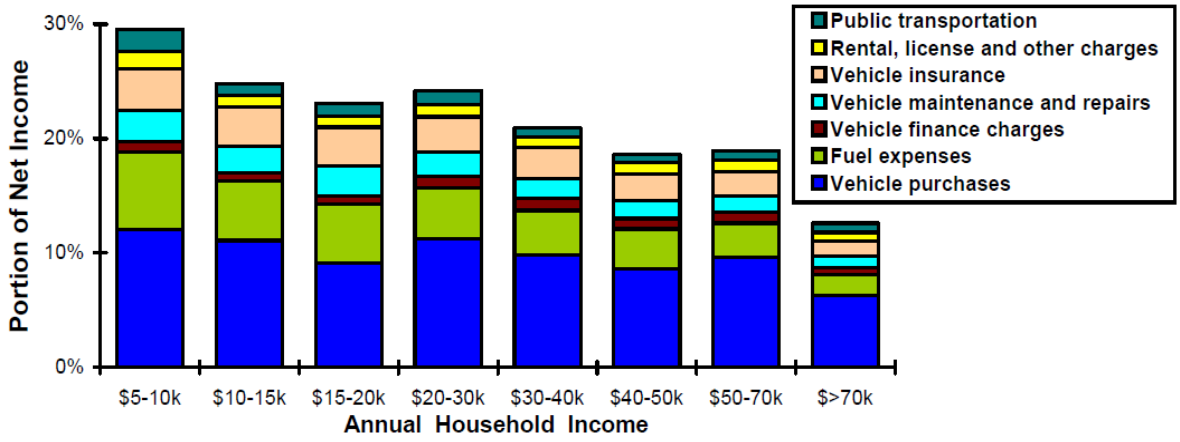
[41] In the case of transit trips, low income individuals are more likely to use the bus whereas non-low income individuals tend to use rail. Therefore, even if the low income trips are shorter, their travel time is longer because buses travel at a slower speed than trains, and individuals may also be required to transfer between buses.

work trip travel time (minutes/ weekday) for a "low income"[42] worker is higher than the work trip travel time for a high income worker (i.e., those earning more than $80,000). This is may be explained by the fact that low income individuals make more walking and transit trips[43] than non-low income individuals.

6.3.4 Transportation Costs

In general, transportation expenditures can be a financial burden for low income households. Figure 6.5 illustrates the percentage of household income net of taxes that is spent on transportation by income category. From Figure 6.5, it is evident that the lowest income bracket (i.e., households with an annual income of $5,000 to $10,000) spent the highest percentage of their net household income on transportation.

> In the Darensburg case, plaintiffs noted that any increase in transit fares negatively impacted their ability to buy food for themselves and their family.



Transportation expenditures are highest as a portion of net (after tax) income for lower-income households, indicating that transportation costs are regressive.
Source: Litman, 2007

Figure 6.5: Portion of Household Income Spent on Transport

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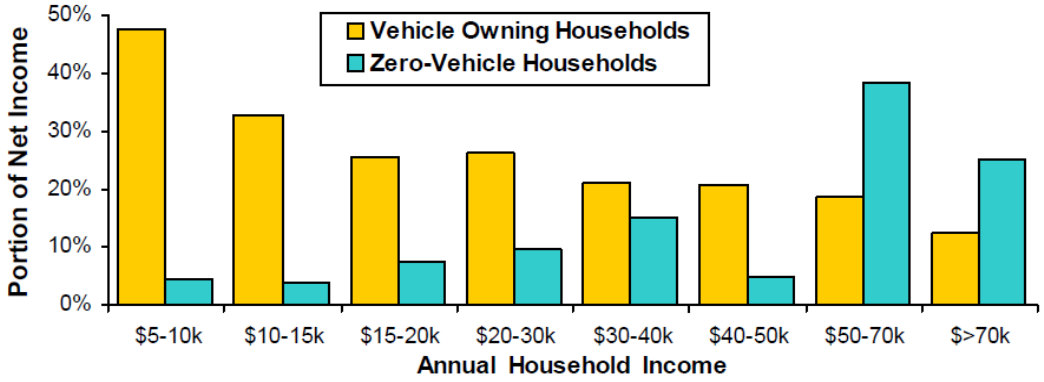
42 This analysis defined a low income individual as someone who earns less than $35,000 per year, which is a much higher value than what has been adopted in other studies.

43 The 1995 NPTS found that the average commute trip travel time was similar for low income and non-low income drivers that use a private vehicle.

Since vehicle ownership represents a substantial expense to any household, a separate analysis was conducted to determine the impact of vehicle ownership on the percentage of net household income that is spent on transportation by income category.



Transport costs tend to be regressive for vehicle-owning households, but not zero-vehicle households.
Source: Litman, 2007

Figure 6.6: Portion of Household Income Devoted to Transport

From Figure 6.6 it is evident that households that own a vehicle spend a significantly larger percentage of their net household income on transportation in each income bracket up to household incomes of $50,000. For example, vehicle owning households that earn between $5,000 and $10,000 per year spent almost 50% of their net income on transportation. On the other hand, zero vehicle households in this income category spent less than 5% of their net income on transportation. As mentioned earlier, this could be partly attributable to the fact that low income households often can only afford to purchase older vehicles, which tend to be inefficient and unreliable, resulting in increased operating and maintenance costs. On the other hand, vehicle ownership is often required for low income individuals to gain access and maintain employment due to insufficient transit options. It can thus be concluded that auto-dependency is regressive and policies that encourage multi-modal transportation options are progressive (Frumkin et al., 2004).

> In the Darensburg complaint Sylvia Darensburg not only worked, but also took a college class in the evening which required her to walk a long distance and severely impacted her time for other atypical household chores and duties because there was no night-time bus service.

It should also be noted that the above analyses only considered the monetary costs of transportation (i.e., fares, fuel cost, vehicle purchase price, vehicle registration fees, etc.) and therefore ignored any "cost" associated with the travel time impacts associated with transit or other non-motorized means of transportation. For example, in the case of transit, trip time can increase substantially if multiple transfers are required. Trip time is also a consideration for modes, such as walking and bicycling, where the monetary cost is absent or insignificant, but the user's dispensable time is compromised. Travel time costs are usually estimated considering an individual's value-of-time, which is typically a function of income.

6.3.5 Travel Time Reliability

Since the majority of EJ trips are made to access "necessary activities", it is often very important for EJ individuals to arrive to their destination on time. Many EJ individuals' jobs have strict policies regarding being late to work. In many cases, lateness results in discipline at work (see Section 6.3.1). If an employee is late, the result may be job termination. Also, if an EJ individual is late to a daycare facility, the penalty for this a fee charged per minute that the individual is late. These consequences for travel time unreliability can thus be extremely serious for EJ individuals, especially given that they often have limited alternative transportation options. A toll road may thus offer a very important option for an EJ individual, because of the reliability it offers in terms of travel time.

6.4 Data and Questions

Against the background provided in Section 6.2 and 6.3, this section of the report attempts to list a number of questions that were framed considering the various trips that households would undertake. These questions have been assembled into a sample questionnaire (shown below) which aims to capture all of the travel dimensions necessary for understanding the travel patterns of EJ households.

QUESTIONNAIRE 1: Toll Road(s) *XX*
Interviewer: _____ Date: _____ Time: _____ Site #: ____ Map #:_____

Interviewer: Mark on the map the area where the respondent live

1. Do you **WORK**? ____ Yes ____ No
    a. If yes, where do you **WORK**? (please mark on the map)
    _____
        i. Do you work multiple jobs? ____Yes ____ No
    b. How do you usually **GET TO WORK**?
    ___ Car (drive alone) ___ Car (carpool) ___ Bus ___ Walk ___ Other
        i. If by car (drive alone or carpool), which are the **MAJOR ROADS** you normally drive/take?
        _____
        ii. If your current mode becomes unavailable, what alternatives do you have (if any)?
        _____
    c. How far is your place of work?
    _____ miles (approximately)
    d. How long does it take you to get to work?
    _____ minutes
    e. What are your typical work hours?
    _____
    f. How flexible are these hours? In other words, what is the penalty for arriving late?
    _____
    _____
2. Do you have **CHILDREN**? ____Yes ____No
    a. If yes, how many **CHILDREN** do you have? _____
    b. If no, skip question 5.
3. Do you OR your child(ren) go to **SCHOOL**? ____ Yes ____ No
    a. If yes, where do you go to **SCHOOL**? (please mark on the map)
    _____
    b. How do you usually **GET TO SCHOOL**?
    ___ Car (drive alone) ___ Car (carpool) ___ Bus ___ Walk ___ Other
        i. If by car (drive alone or carpool), which are the **MAJOR ROADS** you normally drive/take?
        _____
        ii. If your current mode becomes unavailable, what alternatives do you have (if any)?
        _____
    c. How far is your school?
    _____ miles

d. When do you go to school?

_____

e. How long does it take you to get to school?

_____ minutes

f. If yes, where do your children go to **SCHOOL**? (please mark on the map)

_____

g. How do they usually **GET TO SCHOOL**?

___ Car (I drive them) ___ Car (carpool) ___ Bus ___ Walk ___ Other

i. If by car carpool, which are the **MAJOR ROADS** you normally drive/take?

_____

ii. If your current mode becomes unavailable, what alternatives do you have (if any)?

_____

h. How far is their school?

_____ miles

i. How long does it take them to get to school?

_____ minutes

4. Do you have children that you take to **CHILDCARE**? ____ Yes ____ No

a. If yes, where is the **CHILDCARE** located? (please mark on the map)

_____

b. How do you usually **GET TO CHILDCARE**?

___ Car (drive alone) ___ Car (carpool) ___ Bus ___ Walk ___ Other

i. If by car (drive alone or carpool), which are the **MAJOR ROADS** you normally drive/take?

_____

ii. If your current mode becomes unavailable, what alternatives do you have (if any)?

_____

c. How far is the childcare facility?

_____ miles

d. When do you children go to childcare?

_____

e. How long does it take you to get to the childcare facility?

_____ minutes

f. What happens if you arrive late to the childcare facility?

_____

_____

5. Where do you usually **SHOP GROCERIES**? (please mark on the map)

_____

a. How do you usually **GET TO THIS SHOP**?

___ Car (drive alone) ___ Car (carpool) ___ Bus ___ Walk ___ Other

i. If by car (drive alone or carpool), Which are the **MAJOR ROADS** you normally drive/take?

_____

ii. If your current mode becomes unavailable, what alternatives do you have (if any)?

_____

b. How far is this grocery store?

_____ miles

c. When do you go to the grocery store?

_____

d. How long does it take you to get to the grocery store?

_____ minutes

6. If you need to go to the **HOSPITAL**, Which hospital would you go? (please mark on the map)_____

a. How would you **GET TO THIS HOSPITAL**?

___ Car (drive alone) ___ Car (carpool) ___ Bus ___ Walk ___ Other

i. If by car (drive alone or carpool), Which are the **MAJOR ROADS** you would drive/take to get there?_____

ii. If your current mode becomes unavailable, what alternatives do you have (if any)?

_____

b. How long would it take you to get to the hospital?

_____ minutes

7. If you need to go to the **DOCTOR**,
Which doctor would you go to? (please mark on the map)_____

a. How would you **GET TO THIS DOCTOR**?

___ Car (drive alone) ___ Car (carpool) ___ Bus ___ Walk ___ Other

i. If by car (drive alone or carpool), Which are the **MAJOR ROADS** you would drive/take to get there?_____

ii. If your current mode becomes unavailable, what alternatives do you have (if any)?

_____

b. How long does it take you to get to the doctor?

_____ minutes

8. Are there any other trips that you currently engage in?

_____

_____

9. Do you think that toll road(s) ***XX*** will **BENEFIT** any of the trips you listed above?
_____Yes _____ No

a. If yes, Which **TRIPS** will **BENEFIT**?
___Work ___School ___Grocery shopping ___Hospital ____Doctor ____Childcare

b. **HOW** will this toll road **BENEFIT YOUR TRIPS**?

_____

10. Will you use toll road(s) *XX* for any of the trips you listed above?
_____Yes _____ No

a. If yes, Which for which **TRIPS** will you use toll road(s) *XX*?
___Work ___School ___Grocery shopping ___Hospital ____Doctor ____Childcare

b. If yes, why would you use toll road(s) *XX*?

_____

c. If yes, how often would you use toll road(s) *XX*?

_____

d. If no, why would you not use toll road(s) *XX*?

_____

11. Do you think that toll road(s) ***XX*** will **BURDEN** any of the trips you listed above?
_____Yes _____ No

a. If yes, Which **TRIPS** will be **BURDENED**?
___Work ___School ___Grocery shopping ___Hospital ____Doctor ____Childcare

b. **HOW** will this toll road **BURDEN YOUR TRIPS**?

_____

12. Do you think that toll road ***XX*** (shown in the map) will **AFFECT YOUR COMMUNITY**?
___ Yes ___ No
If yes, check all that apply

a. Will it **BENEFIT** your community? ____ Yes ____ No

b. Will it **BURDEN** your community? ____ Yes ____ No

i. If the respondent said benefits, **WHAT** do you see as the **BENEFITS** of this toll road(s)?

_____

_____

ii. If the respondent said burdens, **WHAT** do you see as the **BURDENS** of this toll road(s)?

_____

_____

iii. If the respondent said burdens, **WHAT** can **TxDOT** do to **REDUCE** or **ELIMINATE** these **BURDENS**?

_____

_____

Do You Want to be INVOLVED?
13. Can we **CONTACT YOU IN THE FUTURE** to find out what you think about toll roads?
____ Yes ____ No
14. If yes, What is the **BEST WAY TO REACH YOU**?
____ Come to my home ____ Send a questionnaire
____ Phone me ___ Interview me at the shopping mall/grocery store/community center
____ Come to my church ____ Come to one of the schools in the community
____ Other way: _____
15. If yes, what is the best **DAY** & **TIME** to reach you?
_____
16. Is there **ANYONE** in your community that **CAN SPEAK FOR THE COMMUNITY**?
_____Yes _____ No
17. If yes, Could you please **SHARE HIS/HER NAME** with us?
_____

Personal Information (depending on answer to question 11)
Name:_____
Telephone: _____
Address:
_____

ADDITIONAL COMMENTS:
_____
_____

6.5 OUTREACH TOOLS

A large number of public involvement and public outreach tools have been discussed in the literature and summarized in TxDOT research project 0-5208 (see Table 6.12 for an abbreviated list, as well as the details, strengths, and weaknesses of each technique). As is evident from Table 6.12, public participation techniques include information distribution techniques (e.g., personalized letters, outreach booths, public meetings, and open houses) and public involvement techniques that can be used to solicit information from the public. The latter typically includes focus groups, mail questionnaires, personal interviews, walkabouts, school programs, and deliberative polling.

Table 6.12: Public Participation Techniques

Participation Technique	Details	Strengths	Weaknesses
Personalized Involvement			
Walkabouts	• Door-to-door canvassing of neighborhoods • Inform and involve • Opportunities for surveys/interviews • Opportunities to distribute flyers	• Immediate communication with EJ community members • Takes the project and participation opportunities to the EJ communities • More likely to fit into lives of EJ people	• Large time commitment by agency • Relatively small number of people involved
Personalized Letters	• Send letters addressed to specific individuals • Send personal invitations to events • Send personal informative letters	• Makes an impact on community members if they think their opinions are important to the agency • More likely to capture public interest in the project	• Costly • Might not significantly increase attendance at events
Outreach Booth	• Similar to "info booths" • Set up stands at popular locations within the community • Provide information and involve community members	• Brings participation opportunities to the community • Flexible in terms of time and location • May overcome language barriers	• Not many people may take the time to learn about project and get involved
Local Teams			
Create a local team	• Team formed by local community members concerned about the project • Team help to inform and involve	• Increase attendance at community outreach activities • More personal • Community members relate to other community members better than to agency staff	• Requires substantial resources in terms of time, manpower, and funding • If the community is transitional or too divided, it may be hard to find leaders who are able to bring a strong effort to the community
Meeting Variations			
EJ Public Meeting	• Integrate in the activities people already partake in, such as church activities and community or school events • Increase attendance by having interpreters, refreshments, and staff available to care for children • Multiple meetings at varying times	• Facilitate a large number of community members to get together • Good attendance may produce a lot of results	• Risk low attendance • May not represent full spectrum of EJ community members

Table 6.12 (continued)

Open House	• Similar to public meeting but no speeches/lectures • Lots of visual aids • Agency staff speaks to attendees on a one-to-one basis • Opportunities to do surveys/interviews	• Lots of opportunities for feedback • Overcomes language barriers • Flexible in terms of time • Not as strict as public meeting	• Risk low attendance • May not represent full spectrum of EJ community members
Deliberative Polling®	• Representative sample of community participate in deliberations about proposed project • Exposed to continuing dialogue with experts and stakeholders • Participants are surveyed before and after deliberations	• Lots of opportunities for feedback • Informed judgments about toll projects	• Requires substantial resources in terms of time, manpower, and funding • Participants are required to meet at a specified location for a significant period of time (e.g., weekend) • Risk low participation if participants are not compensated • Significant number of barriers to participation (e.g., transportation to location, available time, etc.)
School Programs			
Create School Programs	• Programs to educate the children about the project and then parents receive information from children • Parents attend a school event where children present information and parents participate	• Flexible • Far-reaching • Overcomes language barriers • It can be designed to fit the specific community	• Not all community members connected to school
Media			
Using the media	• Advertise events/information regarding project using the most popular media resources in area: newspaper, radio, TV, flyers, community news boards, etc.	• Flexible • It can reach a lot of people	• It does not guarantee increased involvement • It can be expensive

Source: Victoria et al. (2006)

While all of the participation techniques listed in Table 6.12 are options for a transportation agency, certain techniques will be more appropriate to overcome the barriers faced by EJ communities in participating and will therefore be more effective in

ensuring meaningful involvement of EJ communities. With meaningful public involvement as the goal, it is critical for the transportation agency to understand the EJ community, including the barriers faced by the community and how to overcome these barriers. Examples of barriers typically faced by EJ communities and how to overcome these barriers are outlined in Table 6.13.

Table 6.13: Overcoming EJ Barriers

Barrier	Overcoming the Barrier – Examples
Individuals holding multiple jobs/unusual job hours	• Take outreach activities to them (e.g., schedule the community outreach activities at days and times convenient to EJ people or at an already scheduled community event)
Low levels of education/ literacy issues	• Hire consultants with special expertise in communicating with people who have low or no education
Unique family structures (e.g., single parents, multi-generational families)	• Provide care for children and elderly during community outreach activities
Less likely to have modes of personal transportation (i.e., private car)	• Hold meetings at locations accessible by public transit • Schedule community outreach activities at places within the community, such as schools, parks, and community centers • Provide transportation to community outreach activities • Ensure access for the elderly and people with disabilities
Less access to internet/technology/computer literacy issues	• Distribute printed materials at laundry facilities, homeless shelters, employment offices, food banks, post offices, bus stops/transit stations, churches, parks, health clinics, grocery stores, community centers, etc. • Distribute information via local radio stations (National Academy of Public Administration, 2001) • Use flyer inserts in newspapers (e.g., Latino papers) or distribute information via school district newsletters/cultural programs
Language barriers	• Translate public documents, notices, and hearings for limited English speaking populations • Provide translations and use bilingual speakers during community outreach activities • Prepare communication materials for limited English speaking populations (e.g., bilingual flyers, bilingual radio announcements)

Table 6.13 (continued)

Distrust of government agencies	• Work with EJ community leaders to increase the credibility of the participatory planning process (FHWA and FTA, 1996) • Hire consultants with special expertise working with minority and low income populations • Hold public meetings or events in non-governmental (or less traditional) buildings such as schools, churches, and community centers (National Academy of Public Administration, 2001) • Provide opportunities for EJ communities to comment prior to making each decision • Keep the EJ community informed • Reply to EJ public input promptly and respectfully
Limited understanding of how a project will affect their lives and how participation in the process would benefit them	• Hold informal meetings early in the process to increase public understanding of how the project may impact the community and their input is important • Seek public input early in the process and make information available • Involve the EJ communities in decisions that might impact them and in approvals and implementation/Provide opportunities for EJ communities to comment prior to decision making • Keep the EJ community informed • Reply to EJ public input promptly and respectfully • Hire consultants with special expertise working with minority and low income populations
Cultural differences	• Identify preferred community outreach techniques (e.g., in Orange County, California, the open-house format and one-on-one interaction made Mexican-Americans uncomfortable, while informal, small group meetings increased the participation of Latino neighborhoods) (FHWA and FTA, 1996) • Work with local church leaders, school principals, community center staff, health clinic staff, etc. to learn more about cultural factors (National Academy of Public Administration, 2001) and to identify venues for outreach activities (e.g., meetings at churches, schools, libraries, or community service centers, or talking face-to-face at individual homes)

Source: Victoria et al. (2006)

From Table 6.13, it is clear that effective and meaningful public involvement of EJ communities require the overcoming of many and varied barriers. As indicated before, a growing number of immigrant households and households where both heads-of-

household work outside the home exist, with the result that disposable time is very limited and traditional data collection techniques, such as traditional travel diaries or surveys, is often not feasible. EJ communities may also regard "conventional" data collection methods of travel diaries with suspicion or fear. Also, since low-income and minority individuals typically mistrust the government and not necessarily understand how a project will affect their lives and how participation in the process would benefit them, it is critical that information be shared with these communities to educate them beforehand to ensure meaningful participation subsequently.

Identifying leaders in the EJ community can thus be helpful in determining which barriers to participation are present in the impacted community. The community leaders will also be able to assist the transportation agency in understanding how to overcome these barriers and will be able to advise the transportation agency on effective approaches to share information with the community. The latter is critical to educate the community and to distribute information about outreach activities to ensure a successful turnout. For example, as indicated before, minority and low income communities typically rent their homes as opposed to owning it. In the case of the Western Wake Freeway project in North Carolina, information was thus distributed by posting flyers on residents' doors in addition to mailing the information. This increased the turnout at

Recommendations for effective public outreach in this study are supported by NCHRP Synthesis 407 entitled *"Effective Public Involvement Using Limited Resources"* that surveyed DOT and MPO representatives in an effort to identify the most effective outreach tools, as well as the most cost-effective techniques. The report also discussed measures of effectiveness, focusing on outcomes reflecting community characteristics and values, and process elements, such as the distribution of a target number of newsletters. Most DOT and MPO respondents reported that the most cost-effective methods were similar to the effective techniques. These included:

- *"A mixture of personal, face-to-face encounters with the public by piggybacking[1] on events sponsored by other organizations;*
- *going to other organizations and making presentations;*
- *holding a variety of small or one-on-one meetings;*
- *utilizing a mixture of print and electronic media, online activities, and visualizations; and*
- *a mixture of print, electronic media, and websites"* (NCHRP, 2010).

events compared to when notices were simply mailed to residents. Other avenues for sharing information with EJ communities include outreach booths at locations already frequented by these communities, such as the local Department of Public Safety office, clinics, emergency rooms, community festivals, school events, local restaurants and shops. Also, as previously mentioned, cell phone usage and internet access are increasing among minorities and low income households. The potential thus exists to use texting to share information about surveys or to distribute information about upcoming outreach meetings, focus groups, or other activities with EJ households. However, the literature findings were inconclusive[44] about the effectiveness of using texting and cell phone surveys in reaching out to and in involving the public. Furthermore, it should be noted that none of the studies focused on EJ and tolling, so the effectiveness of this method in involving EJ communities is largely untested.

In terms of public involvement techniques that can be used to solicit information from the EJ communities, it has been found that the most efficient and effective approaches are those that do not require potential participants to make an effort to participate. As mentioned earlier, EJ individuals are more likely to have multiple jobs or unusual job hours, have unique family structures, and do not necessarily have modes of personal transportation. All of these barriers may deter an individual from attending an outreach activity, such as a public meeting or open house. Therefore, it is recommended

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[44] Link et al (2007) found that text messages were ineffective at generating participation in cell phone surveys. Texting was used in cases where respondents had been called multiple times but did not ever respond. A brief text was sent with information about the survey, the monetary incentive, and a phone number which the participant could call. In this case, it was possible that those respondents who did not answer phone calls simply did not want to participate, regardless of the incentive. In another study by the Pew Research Center (2006), the results of cell phone interviews were compared with the results of landline interviews. Overall, the cell phone interviews were more difficult and expensive to conduct than landline interviews. This was partly because random digit dial (RDD) cannot be used with cell phone interviews, so people had to be dialed individually. The latter increases the overall cost of the survey process. Zuwallack (2009) estimated that in Texas, a cell phone survey costs approximately 2.5 times more than a landline telephone survey. On the other hand, sampling the cell phone numbers was more efficient than landline sampling. Fifty nine percent of the cell phone numbers were eligible for the interview, whereas only 43% of landline numbers were eligible (Pew Research Center, 2006). Finally, providing an incentive of $10 for cell phone respondents helped the response rate slightly, but the cooperation rate was still only 28% compared to 50% for landline interviews (Pew Research Center, 2006).

that outreach techniques be implemented that solicit inputs for EJ individuals at their homes or a convenient location that the individuals frequent regularly. These techniques may include walkabouts or in other words, going door-to-door in a community and speaking with individuals, the creation of a local team, the creation of school programs, games or outreach booths at locations already frequented by these communities, such as the local Department of Public Safety office, clinics, emergency rooms, community festivals, school events, local restaurants and shops. The creation of school programs may be very successful, but it should not serve as the only outreach event, since not all community members are connected to schools. Also, key to developing a trust relationship is working directly with community leaders and showing early on during the outreach program, conceivable benefits to the community, in return for their input.

Ultimately, effective EJ participation should benefit both the transportation agency and the potentially impacted EJ communities. As a result, the transportation agency will face less controversy and the concerns of EJ communities will be heard and can potentially be mitigated. This will foster goodwill and trust between the EJ communities and the transportation agency; the lack of which creates tension, makes meaningful outreach difficult, and could result in costly litigation and project delays.

6.6 CASE STUDY: I-70 EAST CORRIDOR PUBLIC OUTREACH

The public outreach that was conducted as part of the Environmental Impact Statement (EIS) for the I-70 East Corridor project provides an excellent example of an extensive and effective outreach approach. The EIS was a joint effort among the FHWA, FTA, and the Colorado Department of Transportation (CDOT) (FHWA et al., 2010). In addition, the Regional Transportation District (RTD) and the City and County of Denver also worked with the FHWA, FTA, and CDOT to identify multi-modal transportation improvements[45] along the I-70 East Corridor.

When I-70 was constructed in 1964:

(a) the road separated two neighborhoods, dividing the community,

[45] For example, a rapid transit system connecting downtown Denver and Denver International Airport (DIA) was proposed.

(b) an elevated bridge was constructed in the middle of one of the neighborhoods in close proximity to homes, and

(c) the corridor is in the most polluted zip code in the state, containing several freight sites and industrial areas.

There has thus been a long history of environmental concerns among the residents, environmental agencies, and the polluting businesses. This has resulted in a strong sense of government distrust among community members, which is arguably one of the most difficult barriers to overcome. One of the main goals of the outreach effort for this EIS was thus to overcome high levels of distrust by providing opportunities for meaningful public involvement to address the EJ concerns in the corridor.

The public outreach effort was thus designed to foster an atmosphere of openness and trust between the agencies and communities that have historically distrusted all government agencies. While the overall outreach effort comprised many similar elements, each element was customized to address each community specifically in an effort to demonstrate the commitment towards achieving community inclusion. For example, a communication goal was to develop a common understanding of environmental components and how these would be evaluated. One of the corresponding outreach goals was thus to conduct a grassroots approach in the neighborhoods that are directly impacted by the proposed transportation improvements. The overall public outreach approach comprised[46]:

- hiring of outreach specialists from the neighborhoods,
- conducting and requiring extensive training for anyone that will be interacting with the public,
- using flyers to notify residences and businesses of meetings,
- disseminating information about community services in the neighborhoods,
- conducting door-to-door outreach as a first contact in many neighborhoods,
- holding block meetings for neighborhood sub-areas,

[46] This list of outreach techniques was provided in the I-70 Community Outreach Program document developed by CDOT.

- attending neighborhood association meetings and business meetings,
- conducting neighborhood meetings and larger corridor-wide meetings,
- providing translation at meetings,
- providing child care at larger meetings,
- catering meals for meetings,
- developing working groups,
- involving the media in a proactive manner,
- meeting frequently with local and state elected officials,
- providing a variety of means to disseminate information, and
- other outreach techniques.

Outreach specialists from within the neighborhood were hired to serve as the first point of contact with the communities. This allowed the outreach team to benefit from the neighborhood specialists' existing relationships with individuals in the neighborhoods. All members of the outreach team, including the specialists, also had to undergo an extensive day of training to become familiar with the project and their role in the outreach process. The outreach team wore a yellow shirt with the project logo and a name tag at all times during outreach activities to make it easier for community members to identify the members of the outreach team. Members of the outreach team also worked in pairs when administrating door-to-door questionnaires, using a standard dialogue to ensure the same message was conveyed to each household. Spanish speaking outreach team members were available to engage with individuals that did not speak English. Information obtained from these questionnaires was used to understand the transportation characteristics and issues relevant to each neighborhood.

A particularly innovative element of this public outreach effort was the distribution of outreach bags containing resource materials. Community members were given outreach bags with the project logo printed on the front to help identify the project. The bags contained information about the project and resource information within the community available to the residents. The resource information was tailored to each

neighborhood and included the contact information specific to the service organizations in each neighborhood. Meals, translation services, and childcare were also provided at various meetings to encourage attendance. Working groups included creative exercises to aid community members in fully understanding the technical issues of the project. These exercises included activities such as having attendees take traffic and light rail noise readings using noise monitors or serve as planners in deciding where to locate a new postal facility in EJ communities. Finally, the project team also established a project office within the corridor that served as the site for day-to-day project management activities, as well as working group meetings. Overall, this public outreach effort has been regarded a success, accomplishing not only the meaningful involvement of community members, but also addressing the issues of government distrust that is typically a substantial barrier to effective public involvement.

6.7 CONCLUDING REMARKS

This chapter of the thesis aimed to demonstrate that an effective and meaningful public outreach effort to engage EJ communities in assessing how a proposed toll road project/system would impact these communities are a valid and feasible approach in the absence of substantial resources to develop and implement more sophisticated modeling tools. Effective and meaningful public outreach is, however, dependent on a clear understanding of the characteristics of the EJ communities potentially impacted, as well as their travel patterns. The agency thus needs to gather information to develop a clear understanding of the travel dimensions that could be impacted by the proposed toll road or toll road system and engage EJ communities to assess and mitigate the identified impacts of concern

Relevant literature was reviewed to formulate survey questions that will generate the appropriate information describing the travel dimensions of EJ households, as well as help the agency to assess the potential impacts of tolling on various trips conducted by EJ households and the impacts that EJ individuals are concerned about.

The chapter also discussed two types of public participation techniques: information distribution techniques and public involvement techniques that can be used to solicit information from the public. Both types of outreach efforts must be conducted when reaching out to EJ communities. However, it is clear that in both cases, the most efficient and effective approaches are those that do not require potential participants to make an effort to participate. As mentioned, EJ individuals are more likely to have multiple jobs or unusual job hours, have unique family structures, and do not necessarily have modes of personal transportation. All of these barriers may deter an individual from attending an outreach activity, such as a public meeting or open house. Therefore, it is recommended that outreach techniques be implemented that disseminate information or solicit inputs from EJ individuals at their homes or a convenient location that the individuals frequent regularly. These techniques may include walkabouts or in other words, going door-to-door in a community and speaking with individuals, the creation of a local team, the creation of school programs, games or outreach booths at locations already frequented by these communities, such as the local Department of Public Safety office, clinics, emergency rooms, community festivals, school events, local restaurants, and shops.

To conclude, effective and meaningful public outreach can be used by most transportation agencies since it does not require the extensive technical expertise that is required for sophisticated modeling. Finally, the chapter also pointed to future research needs on utilizing cellphones and the internet (i.e., social media) to disseminate and solicit input from EJ individuals.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

Inadequate and uncertain transportation funding have in recent years resulted in a renewed emphasis on using investments that can be recovered by toll charges to finance new roads and modernize existing roads. This has raised questions about environmental justice (EJ) and how it pertains to tolling. In 2004, TxDOT Project 0-5208 was funded to propose an approach for the identification, measurement, and mitigation of disproportionately high or adverse impacts imposed on minority and low-income (EJ) communities by toll roads relative to non-tolled facilities. The methodology proposed had two equally important components: an analysis/quantitative component and an effective EJ participation component. However, the research raised concerns about the ability of various available analytical tools and analysis techniques to measure the potential impacts imposed on EJ communities by toll roads relative to non-toll roads. Therefore, the objective of this study was to extend the work that was conducted under TxDOT Research Project 0-5208 by (a) reviewing the ability of available tools and analysis techniques to quantify and qualitatively describe the EJ impacts associated with toll road projects and toll road systems through an evaluation of state-of-the-practice applications, and (b) recommending a suitable approach to assess the EJ impacts of toll roads and toll road systems on EJ communities. The research conducted to meet the study objectives has culminated in this thesis. This chapter of the report highlights some of the salient findings of the research and provides recommendations for assessing the potential EJ impacts of concern on EJ communities and the trips they undertake.

7.1 LITERATURE AND LEGAL REVIEW

The research conducted in this study updated and expanded the previous "desk study" review of available analytical tools and analysis techniques to measure potential EJ impacts associated with toll roads that have been documented and discussed in published reports, documents, transportation journal articles, and conference proceedings since 2004. A legal review was also conducted of recent EJ court cases that have been brought forward since 2004. The literature review revealed a number of methods that

have been proposed in the academic literature to measure and assess EJ impacts of toll roads. However, these tended to be academic studies and have not been implemented in practice by transportation agencies or toll road developers. Many of these methods also involve a number of assumptions and exhibit limitations that may compromise the robustness of the results. This was exaggerated by the fact that many key terms and definitions are not well defined. In other words, there are many ways that an analyst can view and define equity. The latter makes it difficult to identify situations which are inequitable, and if so, whether that inequity is disproportionately impacting certain communities.

From the review of the case law, it is clear that the legal community involved in developing and assisting EJ communities is becoming more sophisticated in how they structure new EJ cases. Each iteration of pleadings and complaints has become more sophisticated in structure, argument, and language utilized. To some extent, this may be a product of the Supreme Court decision in Sandoval v. Alexander that precluded an individual and community from bringing a suit if they could not prove the requisite 'racial animus'. Academic discourse after this case suggested two avenues under which an EJ complaint may see more success: (1) file under traditional NEPA provisions, which the courts are more familiar with, and (2) file against any segmented environmental assessments or environmental impact statements. In two recently filed cases – i.e., in Minnesota and Virginia - the attorneys have filed under non-adherence to NEPA and a segmented environmental review, respectively. It is recommended that these two EJ cases are followed as the results may provide guidance on how transportation agencies should conduct environmental impact analysis, as well as when or how to segment the environmental assessment. The Virginia case is specifically interesting as it involves tolling and because in this case Arlington County is suing USDOT-FHWA on EJ grounds.

7.2 STATE-OF-THE-PRACTICE

Telephone interviews with key stakeholders – i.e., Federal Highway Administration (FHWA), the Environmental Protection Agency (EPA), and the TxDOT Environmental Affairs Division - were conducted, as well as with State DOTs, MPOs, and toll road developers. The objectives of these interviews were (a) to define key terms and definitions that apply to EJ and (b) to assess the state-of-the-practice in identifying and quantifying EJ impacts imposed by tolling. From the interviews, it was clear that -- with the exception of definitions for a priced facility, a toll road, and toll road system – there was no consensus on how to define many EJ terms and concepts. The interviews with and documentation provided by transportation planning agencies and toll road developers also revealed that very few states have used quantitative tools to measure the EJ impacts of toll roads. In some cases, the FHWA noise model, the four step travel demand model, and ArcGIS have been used during the environmental impact analysis. While the travel demand model has been cited as a useful analysis tool for estimating the impacts on EJ communities imposed by toll roads, it has many limitations that have to be noted. These relate to (a) the data used, (b) the geographic unit of analysis used, and (c) the lack of consensus/ direction as to what constitutes appropriate indicators/ performance measures for EJ assessment. It was also found that most agencies used and recommended public outreach as an effective method to assess and mitigate the impacts of concern on communities potentially impacted by a toll road or toll road system. The research thus explored the feasibility of developing and implementing effective public outreach within EJ communities based on a clear understanding of the characteristics and travel patterns of EJ households that could potentially be impacted by a toll road or toll road system.

7.3 RECOMMENDATIONS

Since concerns associated with toll roads are often unique to the communities that are impacted, it is recommended that effective and meaningful public outreach be used by transportation agencies to assess and mitigate the potential impacts of concern imposed

by toll roads and toll road systems in the absence of substantial resources to develop and implement sophisticated modeling tools.

The relevant literature was reviewed, and the characteristics that typically define EJ households, their activity patterns, and their transportation requirements and characteristics were described. It is very important for a transportation agency to have a clear understanding of these aspects to formulate questions and identify appropriate public outreach tools that will generate the appropriate information. Ultimately, information needs to be collected to help the agency assess and mitigate the impacts that the community is concerned about and to understand how a toll charge may impact the different travel dimensions of EJ households. In this regard, questions were identified which would provide the required data to assess the impacts of a toll road or toll road system on EJ individuals.

Two types of public participation techniques were also discussed, which are: information distribution techniques and public involvement techniques that can be used to solicit information from the public. It was concluded that both types of outreach efforts must be conducted when reaching out to EJ communities. However, it is clear that in both cases, the most efficient and effective approaches are those that do not require potential participants to make an effort to participate. EJ individuals are more likely to have multiple jobs or unusual job hours, have unique family structures, and do not necessarily have modes of personal transportation. All of these barriers may deter an individual from attending an outreach activity, such as a public meeting or open house. Therefore, it is recommended that outreach techniques be implemented that disseminate information or solicit inputs from EJ individuals at their homes or a convenient location that the individuals frequent regularly. These techniques may include walkabouts (i.e., going door-to-door in a community and speaking with individuals), the creation of a local team, the creation of school programs, games, and outreach booths at locations already frequented by these communities. The latter includes the local Department of Public Safety office, clinics, emergency rooms, community festivals, school events, local restaurants, and shops.

Appendix

State-of-the-Practice Survey Results

Alabama DOT

There are several toll roads in Alabama, but these were privately built and funded. Currently, several toll projects are being proposed using state and federal funding. However, the NEPA documents have not been completed and addressed EJ concerns at the time of the interview.

Alaska DOT

There are no toll roads in Alaska. There is only a toll tunnel, which was recently converted to accommodate automobiles as opposed to trains previously. The consensus in Alaska was that the Whittier tunnel did not need to undergo a NEPA review when changed to accommodate vehicles. This was because there was little construction and the tunnel previously charged a toll to the railroad.

Arizona DOT

There are no toll roads in Arizona. There have been discussions about implementing/developing toll roads, but not to the extent that environmental studies or evaluations have been conducted.

Arkansas DOT

There are no toll roads in Arkansas.

California DOT

In the recent past, one toll road opened two years ago. It traverses through areas that had very few homes. None of the homes belonged to EJ communities. It is located close to the Mexican border, and alternative routes were available. There is a managed lane project for which there were no direct impacts, but noise impacts were predicted. There was a great deal of upfront public outreach conducted with community groups, churches, neighborhood groceries, etc. Often times people are in disbelief about the actual impacts of the noise as a result of a given roadway project, so noise testing was done when requested. Some projects are in the environmental review process, for example, a managed lane on I-5. This project could have a direct impact on low income housing and the DOT is paying close attention to this when considering alternatives. During surveys, they make sure to ask individuals whether they use transit because revenues may potentially be used to improve transit systems in the nearby areas. During public outreach, MPOs conduct surveys which are random telephone surveys. They also

post notices and give these notices to churches in neighborhoods. Flyers are also posted containing information about future public meetings.

California DOT

The types of impacts that can be measured in an EJ impact analysis include benefits such as: improvements due to reduced congestion and emissions, reduced border wait times, and increased border crossing choices. These impacts were measured for a proposed new State Route (Tollway) and a new Port of Entry in California. Analysis techniques that were used to measure these types of impacts included value pricing studies, traffic studies, and public outreach, including focus group surveys. Some of the challenges that were encountered included the low response rate to mail-out surveys and low turnout at public meetings that aimed at soliciting EJ community input. There were also challenges in terms of obtaining the demographic data that was needed at a level that was specific enough. These challenges were addressed by attempting other survey methods, such as intercept surveys, focus groups, and stakeholder interviews, and using public outreach materials that were translated into other languages.

Colorado DOT

EJ impacts imposed by toll roads are assessed, but no new toll roads are currently being studied. An EIS for U.S. 36 between Denver and Boulder went forward recently to a ROD. The Colorado DOT EJ methodology adopted in the EIS evaluated a broad range of alternatives and included an extensive public involvement process. The EJ impact analysis began with a corridor-wide demographic analysis using U.S. Census block group data and an initial public outreach effort to EJ communities. The demographic analysis was subsequently refined given local knowledge and experience, and was targeted to community leaders and businesses. A more targeted public outreach effort was also subsequently undertaken. The impacts on all communities were assessed to determine whether or not the identified impacts would be predominantly borne by EJ communities. The analysis aimed to balance potential negative impacts with potential benefits. Both the direct and indirect impacts were considered for the various alternatives. CDOT shared two documents with the research team entitled *"EJ Guidelines for NEPA project analysis"* and "Environmental Justice and Managed Lanes." The latter document provides an amendment to the Denver Regional Council of Governments (DRCOG) Regional Transportation Plan (RTP), which proposes to implement a system of toll roads in the Denver metropolitan area. This request to amend the RTP analyzed how the toll network relates to the transportation system. Typically EJ is considered on a corridor-wide basis, but it was considered important to ensure that policies and practices do not discriminate towards EJ individuals. It was noted that user surveys have indicated that low income individuals are not disproportionately impacted by a toll facility. While higher income users do comprise a larger percentage of toll road users, it was noted that drivers from all income levels recognize the benefits of a toll facility. Another issue that was examined is whether toll charges are more regressive than gas taxes. It was noted

that while tolls may represent a larger portion of a low income individuals' annual income, they are not necessarily more regressive. Whether a toll is regressive depends on the degree to which a driver uses the toll road, the quality of the available alternatives, and how the toll revenues are used. The toll collection method was also considered in determining whether a toll facility disproportionately impacts low income users. It was noted that transponders are often difficult for low income drivers to obtain because a credit card and/or a large deposit payment is required. Low income users may not have a credit card or be able to afford a large deposit payment. The document also provided appropriate language for a NEPA document that addressed the questions/concerns raised.

Connecticut DOT

There are currently no toll roads in Connecticut. All tolling was removed a couple of years ago after a serious toll booth accident in Connecticut. Recently, a couple of environmental studies have considered priced/tolled facilities. In these cases, the tolls would be collected electronically. In other words, none of the facilities will have toll booths or toll collectors. Two environmental documents are currently being prepared that will discuss about the EJ impacts of priced facilities. The EIS will, however, address EJ through a qualitative discussion of the physical impacts of the toll roads. Finally, both the Capital Regional Council of Governments and the Southwestern Connecticut Regional Planning Agency are looking at priced facilities in conjunction with Connecticut DOT.

Delaware DOT

Only one toll road in Delaware underwent the NEPA process, i.e. U.S. 301 two years ago. The potential EJ impacts were assessed by examining the location of EJ communities relative to the project area and the alternative routes. The majority of the EJ analysis, however, focused on the location of EJ communities and less on the alternative routes. No disproportionately adverse impacts were found on EJ communities. All households that were affected, regardless of income or race, were compensated fairly. Coordination with environmental agencies, elected officials, community organizations (i.e., low-income and minority representatives), and the public was an important component of the analysis. No future toll roads are planned, and no issues or concerns regarding equity have been raised by the users or nearby inhabitants of the toll road.

Florida DOT

The Florida Turnpike was developed prior to the Executive Order. Currently, the expansion of an existing toll road in Tampa is planned and the public are being engaged. The expansion will divert trucks off of local roads. Also, the roadway will be raised and therefore it is anticipated that no communities will be relocated or affected. In general, concerns have been raised about moving to completely electronic tolls on the Florida

Turnpike, specifically relating to the potential effects on the elderly and low-income drivers.

The public involvement process for toll roads and non-toll roads are similar in Florida. However, outreach to Limited English proficiency (LEP) communities involves additional efforts, because they are typically harder to reach. Public involvement occurs during project planning and close to project implementation. Letters are sent to residents that would potentially be impacted by the project. The outreach is however, continuous due to population movements. It was noted that the population is much more mobile and people rarely stay in the same place for more than 5 years these days- 5 years typically being the duration of the project planning period. It is thus important to keep the communities and survey data updated.

Georgia DOT

The Georgia 400 toll extension was let in 1990, with the result that the NEPA document did not address EJ concerns. The Final EIS, approved in 1987, however, showed that Georgia DOT met with a number of neighborhood associations in the project area. The impacts of the toll plazas were also evaluated – i.e., the additional right-of-way required and lighting spilling over into the neighborhoods - but no discussion on the impacts of imposing the tolls was included.

Hawaii DOT

There are currently no toll roads in Hawaii.

Idaho DOT

There are currently no toll roads in Idaho.

Illinois Tollway Authority

Illinois has one toll road that is 286 miles long and traverses 11 counties - essentially all the suburbs of the Chicago area. It was built in the late 1950's prior to the enactment of NEPA in areas that were essentially in the "middle of nowhere." These areas are currently populated and issues arose when the tolls were increased. The Illinois Tollway Authority addressed concerns by maintaining the same toll for I-pass holders and doubling the toll for non-pass holders. They also implemented a circuit breaker program, which provides a discount for eligible EJ families. Currently, no major EJ issues have been encountered because most of the communities affected are middle class.

The Illinois Tollway Authority is not federally funded, but they voluntarily go through an abbreviated NEPA process. In the case of new infrastructure projects, the Illinois Tollway Authority mostly assess right-of-way impacts to determine displacements. These impacts are mitigated accordingly. Outreach meetings are also frequently held with local community representatives.

The Illinois Tollway Authority has also begun to utilize GIS to map the billing addresses of their users and determine the "densest locations". This data can be overlayed with Census data to determine whether any locations are EJ communities.

Chicago MPO (CMAP)

The Chicago MPO (CMAP) has not conducted EJ analyses for individual toll projects. They evaluated the EJ impacts of regional systems of toll projects, but transportation implementers can (and should) do their own assessments for specific toll projects.

Indiana DOT

There are currently no toll roads in Indiana.

Iowa DOT

There are currently no toll roads in Iowa.

Kansas DOT

There are toll roads in Kansas that were built before the Executive Order, but no new toll roads are currently being planned. Toll roads have been discussed as a way to fund new projects, but these discussions have not led to any definitive plans. In most towns and cities in Kansas, there are, however, pockets of EJ communities and many different ethnicities are often dispersed.

Kentucky DOT

Kentucky does not have toll roads anymore, because it was determined that all of the toll roads were located in the most impoverished areas of the state. Therefore, all tolls were removed.

Louisiana DOT

There are currently no toll roads in Louisiana and none are being planned.

Massachusetts DOT/ Massachusetts Turnpike Authority

All the existing toll roads in Massachusetts were built before NEPA was enacted. Also, no federal aid was expended on the Turnpike. No new toll roads are being discussed. Instead, the removal of one toll road – the Western Turnpike – has been discussed. There are equity issues with this toll road and there has been a great deal of public outcry over it. The toll road is the only connection between certain western and eastern parts of the state, and people do not feel that it is fair to have to pay a toll in this case. These people are, however, not necessarily low-income. The bond for the Western

Turnpike ends in 2017 so as this date approaches, more options will need to be discussed. One solution may be to simply lower the western tolls and maintain the tolls on the rest of the system. No substantial EJ analysis has been conducted for the Western Turnpike. Also, no formal process for EJ analysis of toll roads has been developed, but it will be in the future.

Michigan DOT

There are no planned or current toll roads in Michigan.

Minnesota DOT

One priced facility was implemented in the last year in Minnesota. This is the only priced facility in Minnesota. The environmental analysis for this facility was minimal since it involved the conversion of HOV lanes to HOT lanes. Previously, only cars with two or more occupants could use the HOV lane. A HOT lane allows vehicles with 2+ occupants to travel for free, but single occupant vehicles can use the lane if they pay a toll. The HOV lanes were previously underutilized. The adjacent lanes are still "free" for all users, and perform better because some traffic has been diverted from the "free" lanes to the HOT lane. The performance of the corridor as a whole has thus improved. The EA for this project led to a categorical exclusion (CE).

Mississippi DOT

For the existing toll roads in Mississippi, no substantial EJ analysis was undertaken because toll roads are not placed next to EJ communities. In Mississippi a toll road must be parallel to a non-tolled road to avoid negative EJ impacts.

Missouri DOT

There are no toll roads in Missouri and no plans for future toll roads.

Montana DOT

There are no toll roads in Montana.

Nebraska DOT

Nebraska has no state toll roads or public toll roads. There are two private toll bridges in Nebraska. Although tolling is usually discussed by legislators and others outside the DOT when entertaining creative solutions to continued funding inadequacies, no toll roads are currently being planned.

Nevada DOT

There are no toll roads in Nevada.

New Hampshire DOT

There are three toll roads in New Hampshire. However, all were built before the EO was enacted. Currently, EZ passes for electronic payment are implemented so that drivers will not have to stop at a toll booth to pay the toll. It is believed that no EJ impacts will be incurred by this conversion. On one toll road, the toll rate was increased for the first time in 10-15 years and there was a public outcry. No MPOs are involved in toll road planning, because there are no large metropolitan areas in New Hampshire. The state DOT office is responsible for these types of projects. There are currently no plans for any new toll roads in New Hampshire.

New Jersey Turnpike Authority

No extensive EJ analysis has been conducted for the NJ Turnpike other than on a project-by-project basis, i.e. for road widening or interchange projects. The NJTA does not use federal funding so they are not required to undergo NEPA. However, the New Jersey Department of Environmental Protection (NJDEP) dictates how EJ impacts should be analyzed in their EA or EISs. The FEIS for a recent Turnpike Widening project is available online at http://www.njturnpikewidening.com/documents.php. In this FEIS, the project site was defined as the area within 500 feet in each direction of the project's right-of-way. A standard procedure is used for identifying the EJ communities in the project area. This information is then analyzed along with various alternatives to evaluate the following impacts: displacements, noise, air pollution, accessibility, and mobility. It was found that no disproportionately negative impacts were imposed on EJ communities in the project area, so no mitigation was necessary.

New Mexico DOT

There are no toll roads in New Mexico and none are being planned. Toll roads are being discussed, but none are being planned.

New York Thruway Authority

New York's toll roads were all built in the 1950's prior to NEPA. Most current projects on the toll roads involve maintenance that do not require extensive documentation. Also, the Thruway Authority funds most projects from toll revenues. An EIS is currently being prepared for a large ongoing project for the Tappan Zee Bridge replacement. The NY Thruway owns the bridge, but the DOT is directing the bridge replacement project. There is also a DEIS going to FEIS in Western NY for the Williamsburg toll area. However, the population in this area is very sparse, so the EJ impact analysis would be minimal.

The research team also contacted the NYMTC, but learned that the NYMTC are only involved at the planning level. They have never had to conduct an EJ evaluation and are not able to identify projects which would require EJ evaluations since they are not involved at the project level.

North Carolina Turnpike Authority

The NCTA's perspective is to combine analysis and outreach to ensure that all elements of the toll road are understood. Most projects in NC are, however, either "toll road or no road." It has been concluded that although EJ communities may not be able to use the toll facility daily, they will still benefit from it. In terms of toll collection methods, NCTA does not require a credit card nor do they collect cash on the road. There are, however, locations in the vicinity that can collect the toll. How users are required to pay a toll is considered during EJ analysis, because this is often a barrier to their usage by EJ communities. Other impacts that are considered during an EJ analysis include: alternative routes, travel times, tolls, degree to which cars would be diverted on neighborhood streets, and noise impacts.

For the Western Wake Freeway - an outer loop toll road in Raleigh - the EJ populations were identified using census data, "free and reduced lunch" data from area schools, field observations, and interviews with local planners. The differences in potential impacts resulting from a toll versus a non-toll facility were evaluated. Recent effects on the communities from past projects were also incorporated into a Community Impact Assessment. Public involvement was a large part of the process, and during this particular project, people did not express concerns about the tolling aspect. Potential effects of this project included visual impacts from the grade separation, as well as noise effects. On the other hand, a benefit of the toll road was increased access to major employment centers. Although the existing route may not be as direct, the non-tolled alternative would see reduced congestion and will operate at an acceptable level of service in 2030 because some traffic would be diverted to the toll road. This was determined using the MPO's travel demand model called the "Triangle Regional Model." Consultants were hired to run the model and the results were reviewed by NCDOT.

NC55 is also currently being widened, which will further alleviate congestion. The tolling method will also consider low-income users and will make the road accessible to all users. No disproportionately high or adverse impacts are anticipated from this project. NCTA also agreed to fund projects in the EJ communities to increase access to new roads and improve park facilities to create an overall benefit for these communities.

North Dakota DOT

There are no toll roads in North Dakota.

Ohio Turnpike Commission

The Ohio Turnpike Commission did not provide any information concerning EJ impact analysis.

Oklahoma DOT

The only toll roads in Oklahoma are privately owned and funded, so the Oklahoma DOT did not need to undergo NEPA prior to their construction. Toll roads are not popular in Oklahoma, but many people use them. The Oklahoma Turnpike Authority uses bonds and tolls to finance facilities, but receives no federal funding. According to the representative, EJ is not regarded a major issue or concern in Oklahoma.

Oklahoma DOT

The turnpikes in Oklahoma are constructed entirely with bond money, administered by the Oklahoma Turnpike Authority (OTA). OTA has never accepted any Title 23 funding, and therefore do not have to comply with the Title 23 rules. OTA, however, has to comply with applicable state and federal laws for permits, for example, Environmental Protection Agency (EPA), Clean Water Act, etc. However, NEPA is a federal requirement, and there is no similar law in Oklahoma. Also, Executive Orders apply to federal agencies and federal actions, and to state DOTs that participate in state administered federal programs.

Oregon DOT

There are no toll roads in Oregon.

Pennsylvania Turnpike Authority

In Pennsylvania, most toll projects are funded using toll revenues and bonds. However, one toll road project required the construction of a new roadway and used federal funds. During this time, the Turnpike Authority followed the guidance from the DOT and developed a methodology for EJ impact measurement with the help of the DOT. They also coordinated with the FHWA Division Office and the EPA Regional Office in the development of this methodology. Because it was a new construction project, the focus was mostly on the direct impacts that the road would have on the affected EJ communities in the project area. The disproportionate and adverse impacts on EJ communities mostly involved displacement. Economic equity considerations regarding the charging of tolls were not examined at the time of the analysis.

Rhode Island DOT

There are no toll roads in Rhode Island.

South Dakota DOT

There are no toll roads in South Dakota.

Tennessee DOT

There are no toll roads in Tennessee. TDOT finalized a Conceptual Feasibility Toll Study on several statewide projects in the Spring of 2009. These studies, however, yielded no feasible projects. Since the studies were conceptual in nature, EJ was not addressed at that time. Currently, TDOT has been directed by the state legislature to explore HOT lanes. But, like the previous toll studies, this activity will be conducted at a very aggregate level and would likely not include an examination of EJ concerns.

Utah DOT

There are no public toll roads in Utah. There is only one toll road that is privately owned.

Vermont DOT

There are no toll roads in Vermont.

Virginia DOT

The only toll road in Virginia for which an EJ impact analysis was conducted is the MLK Expansion project. It was found that EJ populations live throughout the project area. Public meetings, however, showed that the public were more concerned with the tolling of the nearby Midtown tunnel than they were with the MLK Extension roadway. These concerns were supported by the traffic studies showing major traffic movement between Portsmouth and Norfolk via the Midtown tunnel. The MLK Expansion provided an alternate route to I-264 and Route 58, so users could continue to use the non-tolled alternatives. Therefore, disproportionately high and adverse impacts were not anticipated for EJ communities in this project area.

Washington DOT

Washington DOT has measured the EJ impacts associated with primarily planned toll roads, but has also looked at some past projects, i.e., analyzing an existing tolled roadway. The past projects consisted mostly of toll bridges, but also some HOT lanes. One prime example is the SR-520 bridge, where a license plate survey was conducted to identify the travel shed. The DOT recorded the license plate numbers of vehicles crossing the bridge and looked up the addresses. This information was used to conduct phone surveys with potentially impacted households. Currently, there is a bridge located along SR 520 that is tolled, but its replacement is imminent. However, a funding gap exists and toll revenues from the I-90 bridge - providing the sole connection to an affluent island – may be used to fund the new SR 520 bridge.

Typically, the DOT uses a reference population to provide context within a project area, but not for a threshold value. For the reference population of SR-520, they used data from the county in which the project was being done. The specific impacts that were investigated were the length of alternative routes used by drivers to avoid tolls, as well as the viability of these routes, i.e., the level of congestion on the alternatives.

Telephone surveys were relied upon and EJ communities were targeted to ensure that they have input. Focus groups were also hosted and planned, including an all Spanish speaking group. No one, however, came to the planned Spanish speaking meeting, so phone surveys were conducted to reach this group. The DOT also identified organizations involved with low income and minority populations to provide information and insight. It was found that transit was not a viable option for many users, so they were forced to use private vehicles. Also, a high percentage of the users said they would avoid the toll even if the alternate route was longer. Based on both the surveys and analysis of alternative routes, it was thus found that there would be a disproportionate adverse impact on car dependent individuals. However, no mitigation measures were considered.

The research team was also told about a river crossing project currently being reviewed that will connect Washington and Oregon. This project was in the final EIS stages and was challenging because it involved two states, as well as the FHWA and FTA.

West Virginia DOT

There is only one operating toll road in West Virginia, but no EJ impact analysis was conducted for this toll road. There is a proposal before the legislature to develop two toll roads. The first proposes to add capacity to an existing two lane toll road that is being used predominantly by large trucks in the Eastern panhandle of the state. It has been proposed to expand the road to four lanes. The second proposed toll road involves the completion of an existing two lane road. West Virginia DOT ran out of money before completing the last 14 or 15 miles of the two lane road. It has been recommended to implement tolls to fund the completion of the road. The existing road has gone through the NEPA process and it is anticipated that the remaining miles that will be tolled will also go through the NEPA process. Both these proposed toll roads will only move forward if they pass legislation. No MPOs are planning on using toll roads to expand capacity in West Virginia.

Wisconsin DOT

There are no toll roads in Wisconsin.

Wyoming DOT

There are currently no toll roads in Wyoming, but an I-80 tolling study has been conducted. It has been handed over to a legislative committee, who will determine if the project will proceed. If so, a master plan will be developed, and only after that would an EJ impact analysis be conducted.

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